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Plant Engineering

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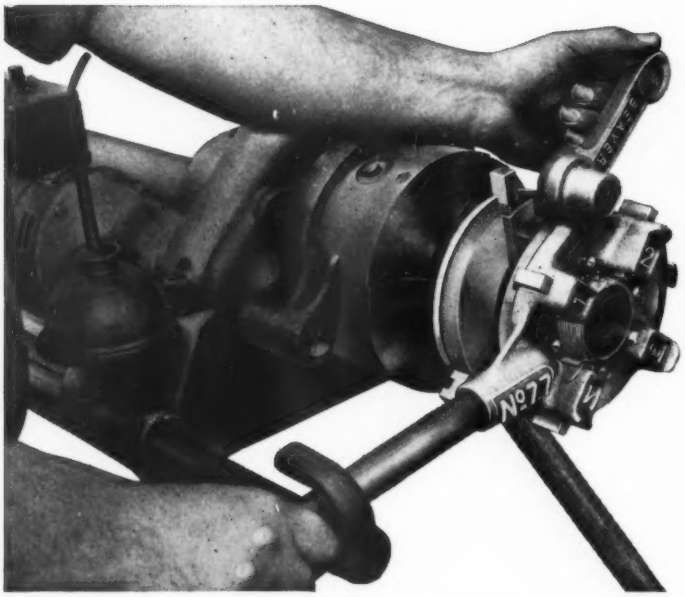
Volume 2, No. 10

The magazine that helps plant engineers with their everyday problems

The NEW BEAVER No. 77 Threader

.....for use with POWER DRIVES!



When the thread is finished, the dies are "thrown open" — no backing off over finished thread. (Beaver Model C-1 is illustrated)

The new Beaver "77" Power Drive Threader—range ½ to 2 inch—uses the same full-width heavy-duty, high-speed steel dies as used in the popular Beaver Models A and B Pipe and Bolt Machines.

When the thread is finished, the dies are "thrown open" — no backing off over finished threads. Moreover, the dies are fully-adjustable to cut standard, over-size, or under-size threads to compensate for the ever-present variation in pipe fittings — especially important when "used" fittings are being re-installed in a new line, as frequently happens.

It is not necessary to lock the Beaver "77" on the pipe — as is the case with receding die stocks using narrow segments and a lead screw. The easy-working self-centering chuck centers the pipe instantly and accurately—insuring straight threads. No "resetting" to size, either! The throwout handle, when closed, brings the dies back into original cutting position and multiple threads can be cut to uniform size, without variation.

Best of all, when you own a Beaver "77", you own a "share" in the largest assortment of dies available for any tool or pipe machine, for there are 186 different kinds and sizes of dies available for Beaver Models A and B Pipe and Bolt Machines —and these are the dies used in the Beaver "77" Power Drive Threader.

You will save the slightly higher first-cost of the Beaver "77" over and over again, through economical maintenance, greatly reduced die-replacement cost, better threads, increased production and substantially lower labor costs.

The Beaver "77" Power Drive Threader—now available through your regular supply house—is suitable for use with all makes of portable power drives!

An Important Advantage — Easy oiling and chip clearance — means better threads and longer die life.

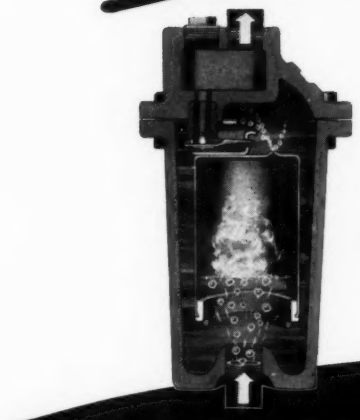
Write for Complete Catalog of New and Improved Pipe & Bolt Cutting & Threading Tools, Machines & Power Drives!

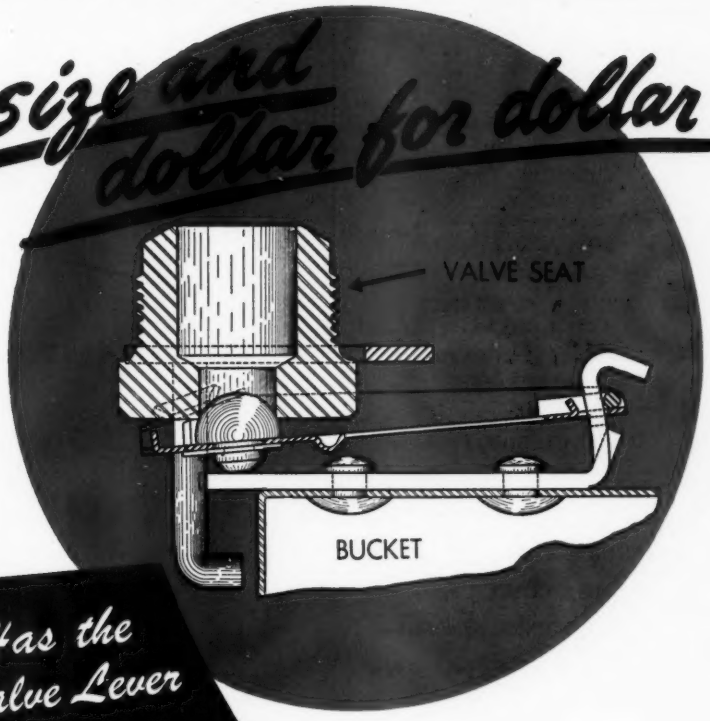
BEAVER PIPE TOOLS

210 DANA AVENUE — ***48 YEARS OF HIGHEST QUALITY*** — **WARREN, OHIO, U. S. A.**

WHY AN ARMSTRONG STEAM TRAP GIVES YOU GREATER CAPACITY

Size for size and dollar for dollar





Only Armstrong Has the "Free-Floating" Valve Lever

● The Armstrong "free-floating" valve lever makes possible large capacity in a small trap and this pays off in *less weight . . . lower price . . . less installation cost . . . less heat-losing radiation area.* Here are two design features that make this possible:

1. High leverage that permits a small, lightweight bucket to pull open a large valve. A small bucket means a small trap and a large valve orifice is essential to big capacity!

2. Sufficient bucket travel to get the valve far enough from its seat that it does not restrict the orifice. A wide open valve means greater discharge capacity!

And, remember, Armstrong continuous discharge capacity ratings are based on actual tests with hot condensate at given steam pressures. Any trap will handle more cold water than it will hot condensate, and some trap capacities are based on cold water ratings.

To get the most for your money, specify ARMSTRONG.

ARMSTRONG MACHINE WORKS
912 Maple St., Three Rivers, Mich.

● Send for the Steam Trap Book. This is a 36-page hand book on condensate drainage. It's low on selling and high on telling — how to select, install and maintain traps. Includes tables, data and diagrams. Also prices, specifications and capacities of Armstrong Traps. If you want a copy, just send for it.

ARMSTRONG "Inverted Bucket" STEAM TRAPS

Factory Representatives in 48 Key Cities . . . Traps Stocked at 147 Points

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Published Monthly by
TECHNICAL PUBLISHING CO.
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CHICAGO 4, ILL.

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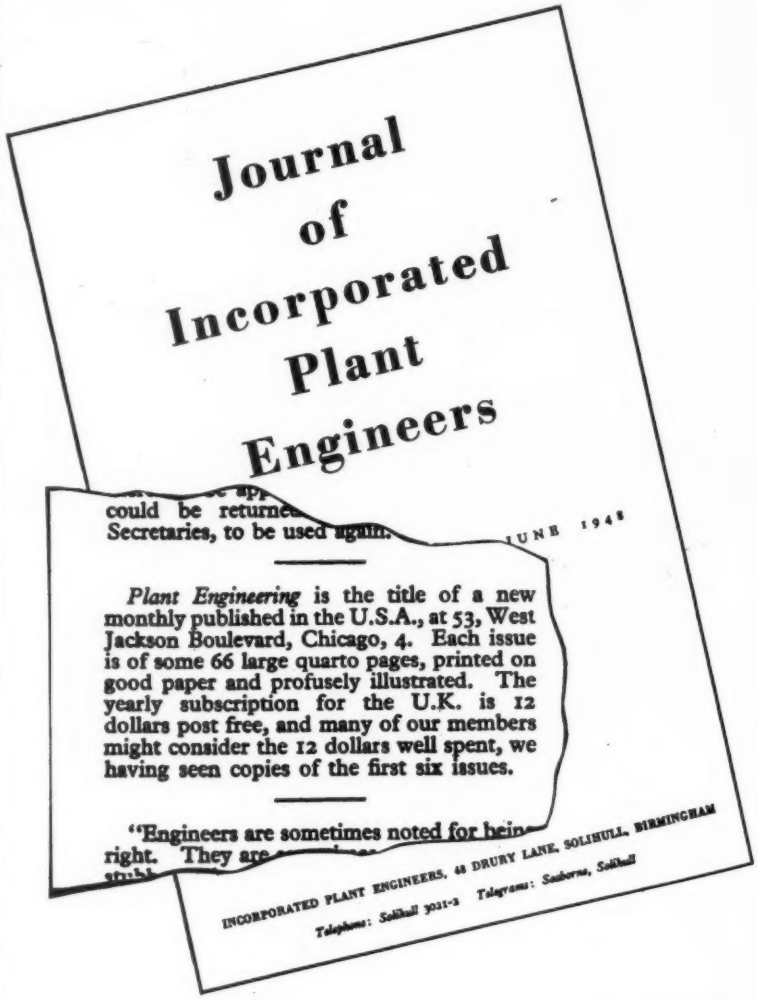
Subscription Information—Published Monthly. Prices: United States and Possessions one year $10.00, Canada one year $11.00. Other countries one year $12.00. Single copies $1.00.

'Round About with the Editors

And With Dollars So Scarce, Too!



Journal of Incorporated Plant Engineers

could be returne
Secretaries, to be used again.

JUNE 1948

Plant Engineering is the title of a new monthly published in the U.S.A., at 53, West Jackson Boulevard, Chicago, 4. Each issue is of some 66 large quarto pages, printed on good paper and profusely illustrated. The yearly subscription for the U.K. is 12 dollars post free, and many of our members might consider the 12 dollars well spent, we having seen copies of the first six issues.

"Engineers are sometimes noted for hein
right. They are

INCORPORATED PLANT ENGINEERS, 48 DRURY LANE, SOLIHULL, BIRMINGHAM
Telephone: Solihull 3021-2 Telegrams: Seaborne, Solihull

● The above friendly notice in the official organ of the Incorporated Plant Engineers, a British association, has already resulted in letters from its members addressed to Plant Engineering. The general tone seems to be: "We sure are interested but how do we get 12 dollars out of the country without violating the law?" All we need now are a few experts on international law, finance and . . . no, not smuggling

Plant Engineering is published monthly at 53 W. Jackson Blvd., Chicago 4, Ill. Subscription price $10.00 per year to U. S. A. $11.00 to Canada. $12.00 to other countries. Single copy $1.00. Application is pending for acceptance under Act of June 5, 1934.

Large number of boiler tubes for maximum heat transfer. Boiler manufacturing methods insure a maintenance-free, long life.

Four adjustable louvered discharge nozzles direct air at any vertical angle.

Beautifully styled, a credit to any shop.

Welded combustion chamber surrounded by a curtain of cool air, keeps outer wall cool.

Light weight (1200 lbs.) makes THERMOBLOC applicable to temporary installations.

Simple gun-type, pressure atomizing oil burner is standard. Interchangeable gas burner available. 82-86% efficiency on either type.

Three control devices make THERMOBLOC completely automatic.

High capacity, axial flow F.D. fan may be operated independently of burner for summer circulation.

Only 30" diameter floor area required for an output of 550,000 b.t.u.'s!

These floor plans illustrate method of one or more THERMOBLOC installations, depending on size of plant. By blanking off one or more outlets, it is possible to place the THERMOBLOC against the wall or even in a corner.

Look Inside

THERMOBLOC

DIRECT FIRED UNIT HEATER

for the answer to your space heating problem

The simplicity of THERMOBLOC design is an important factor in its outstanding success as a heating unit. Built to conform to boiler manufacturing standards, THERMOBLOC provides the most direct, efficient transfer of heat from the products of combustion to air.

Engineers with years of experience in power generation equipment designed THERMOBLOC. The desired operating characteristics were determined by a survey, made to ascertain the requirements of actual users of this type equipment.

Clip the coupon and mail it for your copy of Bulletin #300 on this latest and most efficient unit heater.

THERMOBLOC DIVISION

PRAT-DANIEL CORPORATION

72 Water St., E. Port Chester, Conn.

Thermobloc Division
PRAT DANIEL CORPORATION
72 Water St., E. Port Chester, Conn.

I would like to have further information on the New Thermobloc Unit Heater. My heating requirements are sq. ft. floor space.

NAME_____

COMPANY_____

ADDRESS_____

New Products and Methods

WHAT'S NEW? Here industrial ingenuity is summarized for your quick review. If you want additional information or have questions on specific applications use the addressed no-obligation, no-postage card between pages 18-19 and 50-51

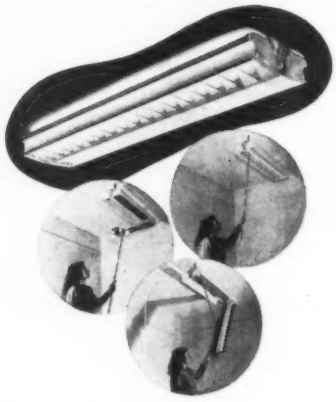
OPEN-END WRENCH

1 This new open-end ratchet wrench is designed for use on pipe, tube, conduit, cable, and rod fittings where an ordinary ratchet cannot be used. The ratchet heads operate in a 7½ deg arc or less, which makes it ideal

for restricted areas. Ratchet heads, sockets, and accessories may be bought separately or in sets in practically all sizes. An adapter also makes it possible to use standard sockets with the ratchet head. C. J. Hendry Co.

HINGED LUMINAIRE

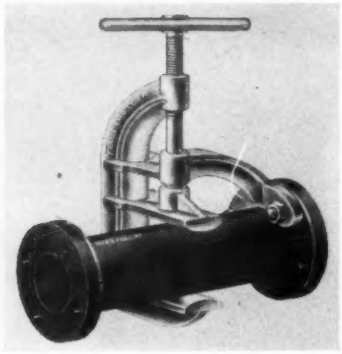
2 With this new fluorescent fixture a lightweight maintenance rod is all that is needed for servicing and cleaning. This is done right from the floor by simply using the rod to lower the reflector assembly. The assembly in this fixture includes lamps, lampholders,



starters, ballast, wiring, reflectors and louvres. Thus the entire assembly can be cleaned and washed at floor level. The channel to which the assembly is hinged weighs only 10 lb and is quickly wired as there are no accessories or wiring to interfere. Edwin F. Guth Co.

PINCH TYPE VALVE

3 A new valve for controlling the flow of highly abrasive corrosive materials through a line is announced. It is claimed that this valve allows full pipe capacity with equal pressure drop. It is easy to install and align. The smooth bore minimizes incrustation, permitting easy cleaning by tapping or flexing with a mallet. The valve is said to eliminate water hammer and absorb vibration. There are no internal parts to wear or cause obstruction. Throttling the valve will not cause undue cavitation or wire drawing. It will not freeze or break. The control mechanism is located in mid-position by a bracket which also keeps the mechanism in an upright and 90 deg posi-



tion from the body. It is made of semi-steel frame and moving parts are of stainless steel. Available in sizes from 1 to 10 in. for working pressures up to 100 lb. Other sizes from 12 to 96 in. Farris Engineering Corp.

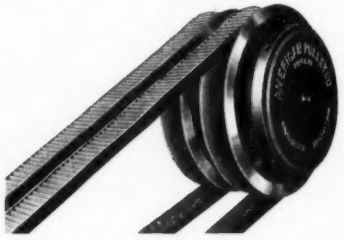
SMALL TACHOMETER

4 A completely new, rugged, small-size, low cost electric tachometer, designed for continuous operation, is announced. Measuring only 2¾ by 5⅜ in. this small unit is housed in a cast bronze case, the new tachometer will operate in any position through a wide range of temperatures. Model M-1200 tachometer provides exceptional performance over a wide range of speeds and is substantially free from the effects of stray magnetic fields. Unit is equipped with a large driv-

ing shaft. Grease-packed ball bearings assure accuracy and long life. Various shaft arrangements are available to meet an unusually wide variety of operating conditions. Electric Tachometer Corp.

ADJUSTABLE SHEAVE

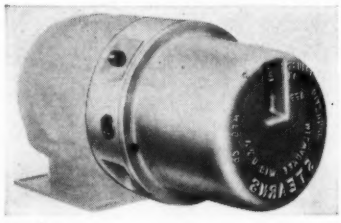
5 A new wide-range, adjustable-diameter drive, is claimed to be the first sheave that provides permanent adjustability. New feature is the rubber-lagged hub. Bonded to the steel hub of the sheave, the rubber section eliminates freezing and cuts out noise, pounding and vibration. Each individual flange, as well as the entire assembly, is dynamically balanced. The adjusting mechanism provides a positive means of shifting all flanges simultaneously. A single locking screw prevents flange movement while sheave is in operation. In addition to the rubber-lagged hub, non-corrosive features of the adjusting mechanism are stainless steel screws connected with specially constructed gears, enclosed in a dust-proof housing. Wide-range, adjustable-diameter sheaves are made in two and three grooves with pitch diameter varia-



tion of 5.25 to 10.0 in. for speed variation is made while the drive is stationary. Wide-range adjustable-diameter wedgbelt sheaves are designed to utilize multiple R section V-belts. They will hande loads up to 15 hp. American Pulley Co.

DISC BRAKE

6 A new magnetic disc brake for fractional horsepower application is announced. Series X-60 brake is suitable for ⅛, ¼, ⅓, ½ and ¾ hp motor use. Features are: that the

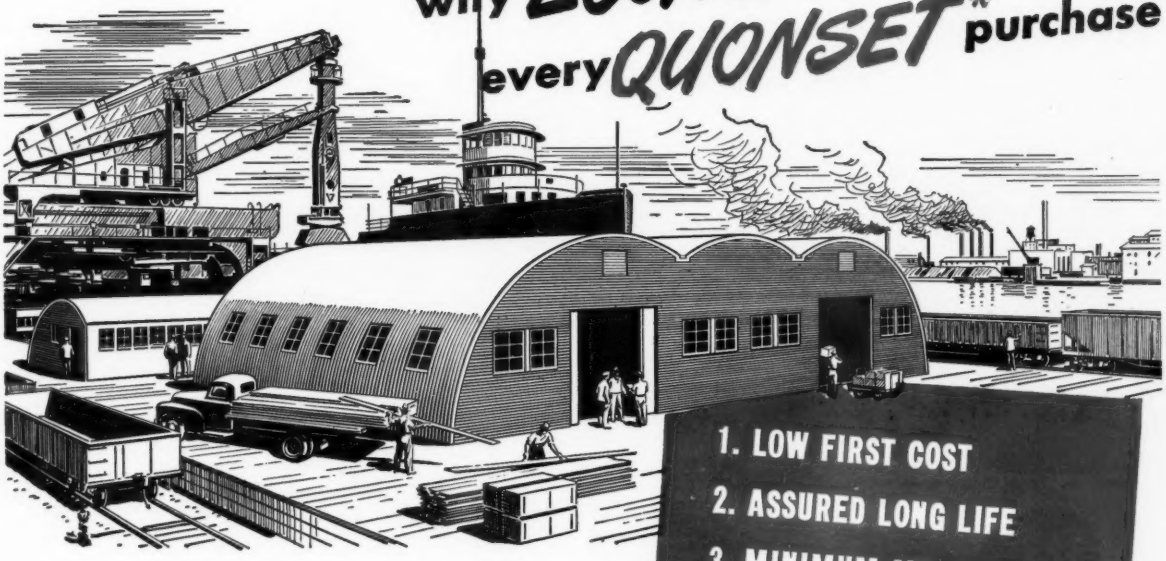


housing is a cover for the mechanism only and can be removed without disturbing the operating parts; straight line solenoid pull for maximum mechanical efficiency; lining wear indicator and ease of adjustment to compensate for lining wear; brake can be completely and easily disassembled for inspection, and linings are free from rivets to provide maximum wear. The brake is offered for continuous or intermittent duty; for a c or d c and is adaptable for motor or floor mounting and for orizontal or vertical operation, all as specified. Stearns Magnetic.

COUNTER

7 Photoelectric counter Type 20AP5 is a general purpose unit for installation of any conveyor system or automatic machine. It is designed for brewery, and dairy fields; for loading chutes and conveyors; for painted, hot objects, and small objects; for textile and leather piece goods; and for selective counting by height and length. The light source supplied with the photoelectric counting equipment has an adjustable lens system which permits narrowing down the light beam for counting very small objects. Counter Type 20AP5 is packaged complete including light source, photoelectric control, and electric counter. Simplicity of installation is featured. The light source and electric counter are supplied with cords and plugs which attach to the photoelectric control. This has a line cord for plugging into any lighting circuit. The counter can therefore be installed quickly and without the help of an electrician. The same counter will count bottles or

3 Reasons why ECONOMY is part of every QUONSET* purchase



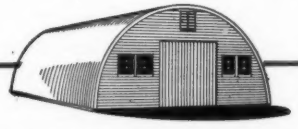
You get all three when you buy a Quonset!

You get *low first cost* because all Quonset framing members and steel sheathing used to build a Quonset are delivered pre-cut to exact dimensions from the factory. This eliminates time and labor consumed in cutting and fitting materials on the building site. Furthermore, the steel sheathing is *nailed* to the Stran-Steel arch ribs. This is made possible by the patented nailing groove in every framing member. If the interior is to be finished or partitioned, the collateral materials can also be *nailed* to the Stran-Steel framing. Your Quonset goes up fast—gets you in business sooner at less cost.

You get *assured long life* with a Quonset because of the strength and durability inherent in the all-steel construction of the Quonset, with its rugged arch-rib design. And, of course, a Quonset is fire-resistant.

You get *assured minimum maintenance* that saves you time and money because Quonsets are sag-proof, termite-proof and rot-proof.

Yes, a clear-span Quonset provides more usable floor space, at less cost, in less time, than other building types. See your nearest Quonset dealer about the Quonset building most suitable to your needs, or write today for his name and address.



This is the Quonset 40—40 feet wide; length variable in 20-foot sections. The other members of this quality building family are:

QUONSET 20—20 feet wide; length variable in 12-foot sections.

QUONSET 24—24 feet wide; length variable in 12-foot sections.

QUONSET 32—32 feet wide; length variable in 12-foot sections.

QUONSET 36—36 feet wide; length variable in 20-foot sections.

QUONSET MULTIPLE—Width variable in sections of 20′-6″; length variable in sections of 20′-0″.

*REG. U. S. PAT. OFF.

YOU NAIL TO STRAN STEEL FRAMING

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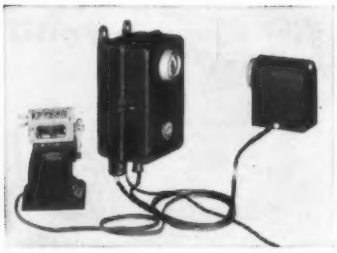
New Products and Methods



cases, light objects or heavy objects. One or more may be located anywhere in the plant, remote from the location where the count is being made. Photoswitch, Inc.

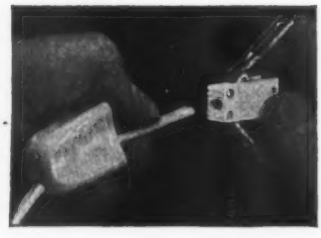
BUCKET TRAP

8 Announced is the Type B inverted bucket trap, with stainless steel working parts. The cover plate, mounted at an angle with the body, carries the entire working mechanism of the Trap. It can easily and quickly be removed without breaking any pipe connections. From the cover is suspended the

bucket and lever with valve through a fulcrum plate which serves also as the valve seat retainer. An outstanding feature is the positive alignment of the valve with respect to the valve seat. The valve seat is applied to a bored recess in the cover casting and held rigidly in place against a seat gasket by the heavy monel fulcrum plate stamping which is slipped over the valve seat shoulder and secured in place with three rugged fillister head screws. Since the fulcrum point for the lever arm, which carries the valve, is thus integral with the valve seat retaining plate and positioned by the seat, positive relation of the movable valve to the fixed seat is always maintained within extremely close limits. O. C. Keckley Co.

AUTOMATIC PLUG

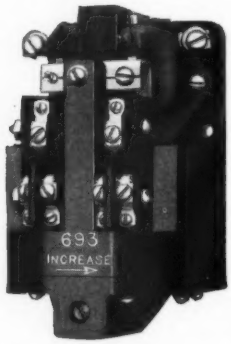
9 A new type lifetime automatic attachment plug cap which requires no stripping or slitting is being manufactured. The plug is molded of durable Plaskon and comes in a wide variety of modern pastel colors. No screws, soldering or crimping is used to attach plug. Connection is automatically accomplished by metal points incorporated in



swingable blades. These points pierce insulation of individual conductors and make electrical contact. Academy Electrical Products Corp.

PNEUMATIC TIMER

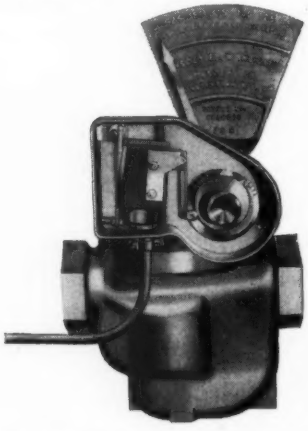
10 A new a c pneumatic timer designed for a wide variety of industrial control timing needs such as machine tools, conveyors, automatic processing equipment, etc., where dependable performance is required, is announced. The new timer is extremely small in size being 2¾ by 4⅞ in. high. Its timing adjustment, easily made from



the front of the unit with a screw driver, is unusually simple. Eight turns of the screw gives the entire timing range from 0.3 seconds to 3 min. Reset of the timer is practically instantaneous. The timer is available either with one or two timing steps—the two steps eliminate the need of one timing relay. The two steps of timing are independently adjustable over the entire range. Cutler-Hammer, Inc.

WATCHMAN

11 A new alarm system consists of selectivity controls, a sensitive microswitch and electric wires leading to an alarm. The pointers of the controls are set at the desired maximum and minimum rates of flow and locked with a knob. When the rate of flow varies beyond that set by the pointers, the microswitch closes contact and sets off an

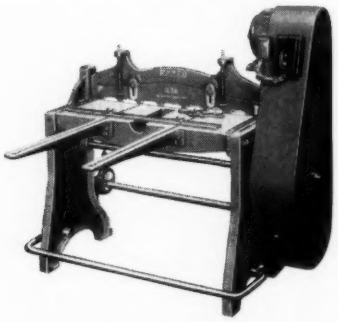


alarm, either a light or noise signal, to warn the operator. A very accurate selectivity range is possible with the new alarm unit. The alarm may be set to operate a signal when the rate of flow exceeds limits of a fraction gpm, or will operate at the widest range limits. Visual reading of the dial is retained. Hensey Co.

POWER SHEARS

12 Introduced is a line of power squaring shears. They are capable of cutting 18 ga stock easily and rapidly. Three models are available, 36, 42, and 52 in., their respective shipping weights with motor are 1050, 1200, and

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51



1400 lb. Inlaid, precision-ground, high carbon tool steel blades are regularly furnished as standard equipment, as are adjustable front and back gauges, hold-downs and guards. The shears have special single stroke mechanisms which can be easily set for continuous operation. Famco Machine Co.

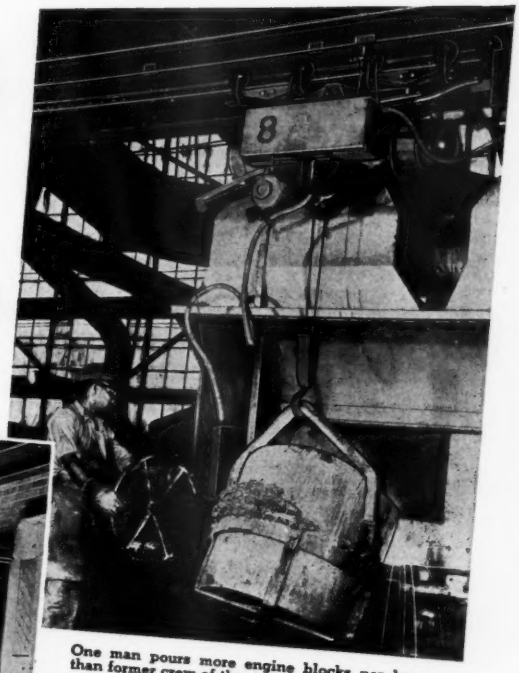
SEWAGE PUMP

13 A redesigned and improved small non-clog sewage pump is announced. The new pump is primarily adapted to the pumping of miscellaneous pulps, sewage, or trash. Shaft and bearings of the new pump have been increased in size, using a two-row heavy duty ball bearing with matched angular contact thrust bearings. Both radial and thrust bearings are enclosed in a sub-assembly cartridge for easy, quick replacement of the rotating element. Removal of the rotor does not expose bearings to dirt and does not lose adjustment of bearings. For protection against moisture and corrosive gas, all bearings are grease lubricated. Six rings of packing with a lantern for external seal connection are provided on the stuffing box. The sturdy labyrinth flinger is positive with a large bearing surface to eliminate any leakage between the shaft and flinger. A simple external adjustment is provided to take up wear at the impeller inlet. Economy Pumps, Inc.

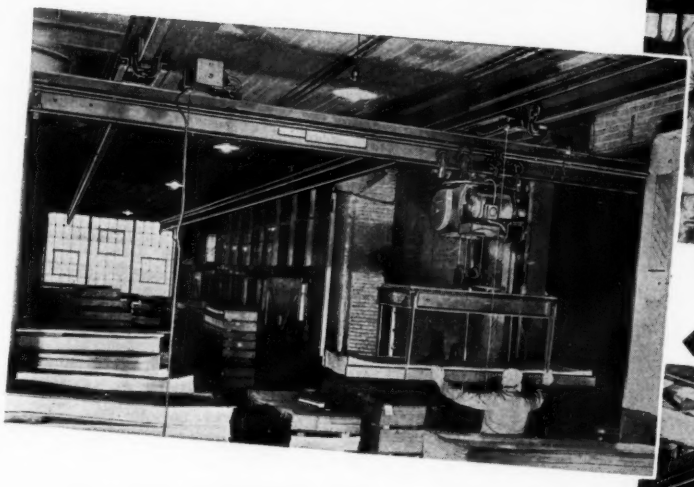
TORCH TIP CLEANER

14 This kit is approximately the size of an automatic pencil, and is designed with pocket clip so that it can be carried in the pocket much in the same manner as a pencil. The end is a tempered steel double-end chuck holding drill sizes 45-80. The handle holds 24 different size drills. Twelve assorted drills

HEAVY LOADS GO "Up and Over" with finger tip control



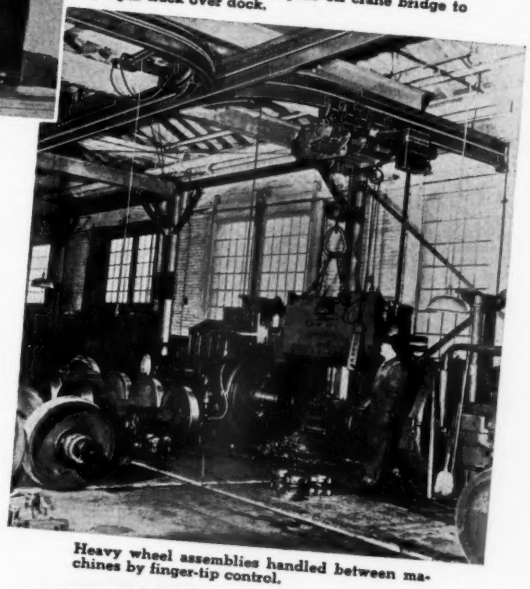
One man pours more engine blocks per hour than former crew of three.



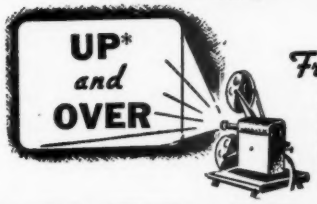
Two ton loads of steel pass off crane bridge to spur track over dock.

American MonoTractors do the hard jobs the easy way. They perform automatic "Up and Over"* handling operations with extreme accuracy and reliability. Finger-tip control assures accurate movement and spotting of the load. "Up and Over" machinery and equipment means no damage to machines or materials and no congestion in the operating area. More important, they eliminate back-breaking labor. The hazard of bad strains and hernia is gone.

In short, American MonoRail Overhead Handling Equipment increases production, saves labor, saves time and cuts costs. American MonoRail engineers will gladly show you that automatic handling pays and saves.



Heavy wheel assemblies handled between machines by finger-tip control.



Free MOVIE

A twenty-minute 16 mm. sound film gladly loaned upon request.

THE AMERICAN MONORAIL COMPANY

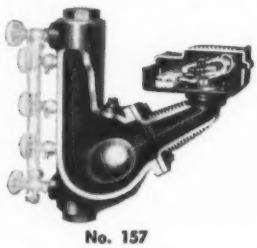
13123 ATHENS AVENUE **CLEVELAND 7, OHIO**

New Products and Methods

in even number sizes 52-74 inclusive, are supplied with the kit. Since this tip-cleaning tool actually uses carbon steel drills, most every welding tip can be cleaned and reconditioned in a matter of a minute or two. Price $3.50. J. M. Ragle Industries.

BOILER CONTROL

15 A new safety control that offers a self-contained water column for high pressure boilers has recently been announced. Designed for 150 psi, the No. 157 is actually the dependable No. 150 in a new water-column form and makes available low water cut-off, pump control, and low water alarm or any com-

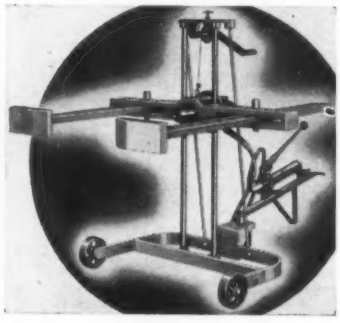


No. 157

bination of these functions. By making the control an integral part of the water column, practically all equalizing piping and fittings are eliminated. As a result, installations are quick, simple, and trim; reproduction of the boiler water level is ideal, and effective, direct blowdown can be provided. Still another important feature is found in the positioning of all tappings for water-glass and tri-cocks in the end of the body so that the control may be located on either side of the boiler. McDonnell & Miller, Inc.

PULLEY PULLER

16 Removal of almost any object from a motor shaft is simplified with a portable, hydraulic pulley puller. Even rusted, fast stuck pulleys and gears can be removed by the device which can be handled by one man. Pressure is applied to a hydraulic jack by a hand



pump. Three adjustments set puller to dimensions required. Beams, arms, jack and pump can be removed from puller stand for overhead or other special uses. Large size is mounted on wheels and exerts 20 tons pressure and small size mounted on a flat stand with a 5 ton rated capacity. A special ram adapter can be obtained to handle shafts of nearly any diameter. Industrial Engineering Equipment Co.

LOADING CONVEYOR

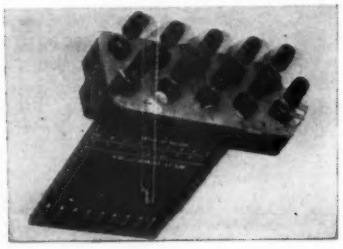
17 A new portable conveyor designed for use in loading cotton seed, peanuts, grain, etc., has been developed. Constructed of selected lumber the loader is braced at all points with metal where splitting might take place. Each end is protected with scuff irons and the loader is fabricated in such a way as to make it very rigid and enable it to withstand severe shock. The manufacturers claim a number of advantages in addition to light weight and ruggedness, including an eight in. conveyor belt of three ply cotton with adjustable tension; easily demounted motor, automatic clean-out; and available in 16 to 24 ft lengths, with or without motor, and a belt speed of approximately 600 fpm. Hudson-Edwards Mfg., Co.

WELDING ROD

18 The need for a suitable welding for tight steel joints has been fulfilled with the production of a smaller diameter size rod for steel torch welding. Eutecrod 16, in size 1/32 in., is intended for such tight steel joints. This patented alloy in size 1/32 in., to low-heat weld all steels, is designed for use with flux No. 16. It may be used in ring form, prepiaced and heated, either by torch or induction heating. Eutecrod 16, size 1/32 in., will find applications in aircraft plants, instrument manufacturers, tool and die shops, sheet metal industries, tipping small tools, where the larger diameter welding rods have been found unsatisfactory for tight fits. Eutectic Welding Alloys Corp.

TEST PLUG

19 A new test plug for drawout relays, designed to make testing of relays easier and quicker than heretofore, has been announced. The plug is made of sturdy plastic molding. All terminals are mounted on the vertical front of the plug. Each terminal is clearly



marked on the front, eliminating the necessity of counting stud or relay connections. Stud terminals are colored bright red. Relay connections are black. A complete set of hardware, including shorting bars and clips for test leads, accompanies each plug. Switchgear Div., General Electric Co.

GLASS ADHESIVE

20 Users of glass containers will be interested in an adhesive which will apply labels to difficult glass surfaces such as opal. It may also be used to apply labels to oily, wet or hot bottles. Labeltite 405, a recent development, will operate cleanly and efficiently on all the principal types of semi-automatic and completely automatic labeling equipment. Adherence will be obtained to all glass surfaces. Labeltite 405 does not show any tendency towards crystallization. National Adhesives.

GREASE

21 A new lubricant, X-5 Multi-Purpose Grease, is announced. In factories X-5 is used as a general lubricant, decreasing time between applications, cutting grease consumption, and errors. Valvoline X-5 changes very little in body up to 400 F. It does not combine with water and is water resistant. It not only sticks on where it is placed, but also enables equipment to resist rust, does not thin or drip from the bearings. Freedom-Valvoline Oil Co.

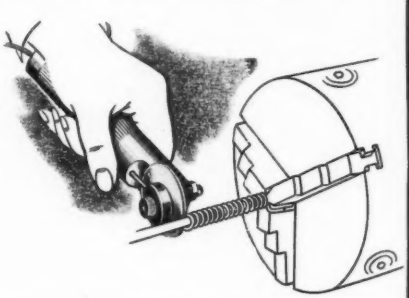
ACID PROOF COATING

22 A new coating which is said to resist corrosion is offered for wood tanks, floors, racks, tables, fume hoods, and other equipment made of wood. Maker claims that the joints made with Carbo-Kote are stronger than the wood itself. It is said to resist heat up to 325 F indefinitely. It resists most acids, alkalis, solvents, and mixtures. The exception is nitric acid. Also sulfuric acid of more than 45 per cent concentration. Surface is flexible up to 10 to 15 per cent. Carbo-Kote is intended primarily for wood but works equally well on rubber, carbon, and fireglass. With a special primer it may be used on steel. Carboline Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

SPRING WINDER

23 The Empire spring winder is claimed to produce all types of springs quickly and accurately. It is manufactured in one standard size which handles wire up to and including $\frac{1}{8}$ in. thick. Produces coils at a maximum pitch of $\frac{5}{16}$ in. The wire feeds through the



handle. Turns of spring are pre-selected and fixed. Wire tension can be adjusted before and during forming operation. It is said to make all types of springs, both open and closed of either compression or extension. Greene, Tweed & Co.

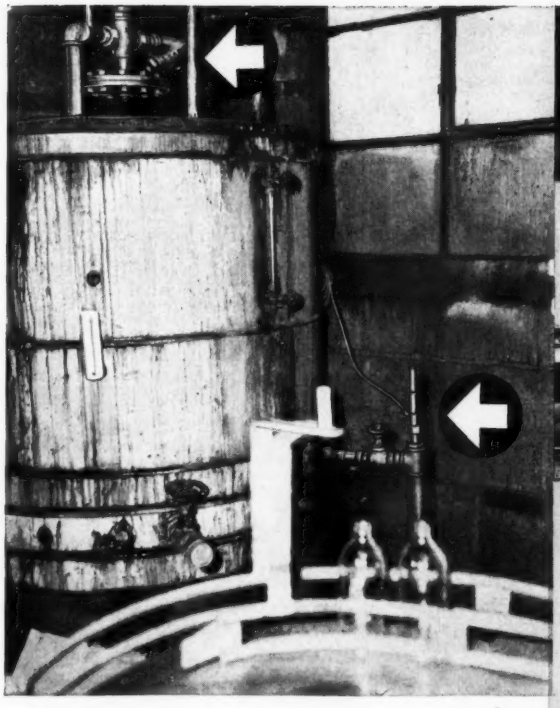
SELF-LOCKING PLIER

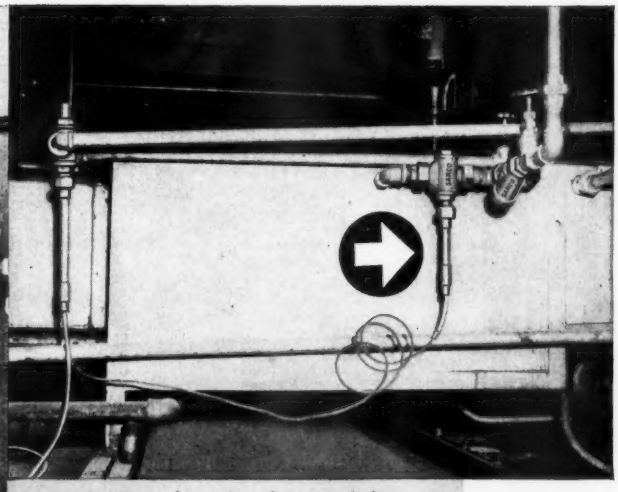
24 This 8 in. side wire cutter is claimed to feature a double compound eccentric cam action that gives considerable cutting power. The plier

locks by normal hand pressure and holds, leaving both hands free to work. It is made of drop-forged chrome vanadium steel. Price is $4.50. Ross Mfg. Co.

BATTERY TERMINAL

25 Introduced is a new spring type battery terminal for use wherever storage batteries are used. It is claimed that use of this terminal eliminates the chance of loosening battery post on removal, avoids breaking top of battery cell, makes it easy to remove ter-

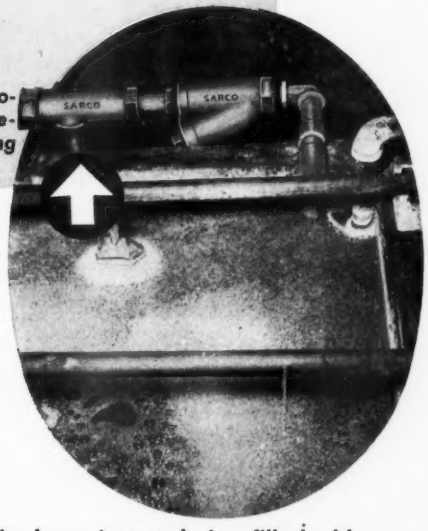




Sarco Controls on Proof Box in Bakery

Sarco 2430 Control on Vinegar Sterilizing Tank.

Sarco 87 Thermoton Reduces Rejects in Tin Plating Tank.



How Sarco REDUCES REJECTS . . .

Process heat is often applied toward the end of the production cycle. A rejected product at this point means lost materials, lost labor, and lost production—all gone forever with no salvage, as a rule.

Many hours of work are represented in the contents of the 1000 gallon per hour vinegar pasteurizer illustrated. Yet, with hand control the vinegar could scorch in a few minutes—or crack the jugs, and it did frequently.

In another part of this plant, old vinegar jugs are caustic-washed previous to being filled with commercial cleaning solution. Two out of six jugs were cracked with hand temperature control. Now all temperatures are controlled with Sarco—all products uniform, day in and day out, and spoilage is negligible.

Other Sarco controls are daily reducing the percentage of rejects in plating, baking (temperature and humidity controls) syrups and a hundred other chemical and food applications, and Sarco Steam Traps are reducing rejects in many industries by keeping heat up in every part of the coils.

231

SARCO

SAVES STEAM

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

New Products and Methods

minal for inspection or cleaning. Installation of the terminal to cable is simple as the nut is split nearly in two. To fit the cable it is only necessary to split the nut completely and insert the cable following by screwing the terminal up on the nut. Terminal is made of aluminum alloy. Nut and pressure spring are cadmium plated to resist battery acid. James A. Stanley Co.

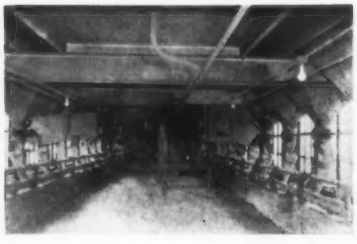
WINDOW PLATFORM

26 A new window platform designed to provide security and save time for window washers, painters, glaziers and other maintenance men who must work on the outside of windows is available. It rests on the outside sill and is held firmly in position by means of a

bar of rail carbon steel tubing on the inside . . . telescopic for window width adjustment. Bar is equipped with rubber finish. Adjustable for varying wall thicknesses. Each bracket tested for 800 lb. Guard rail 34 in. high. Quickly adjusted in one minute, one adjustment being usually sufficient. Collapses compactly for carrying from one window to another or for storing. Weighs 32 lb. Standard Platform is adjustable for windows up to 4 ft wide. May be furnished for windows up to 7 ft wide, when specified, at no extra cost. Price $37.50. Industrial Products Co.

DUST CONVEYORS

27 Announced is a standard design for a pipe conveyor to remove accumulated dry dust from collector hoppers. By installing these conveyors dust hopper gates can be dispensed with. Dust tight connections employed between the bottom of the hoppers and the carrying run of the conveyor pipe prevents loss of dust and results in a self sealing unit. The conveying system, utilizing rubber flighted sealed pin chains, solves the problem of abrasive dust handling. With all round rubber flights in restricted pipe sections, operation under varied pressure or vacuum conditions is easily accomplished. One daily collection of dust by



means of a truck outside the building will remove all dust hazards within buildings as well as resulting in considerable saving of labor. One conveyor can receive dust from a series of collector bins and convey and elevate any reasonable height or distance. Hapman Conveyors, Inc.

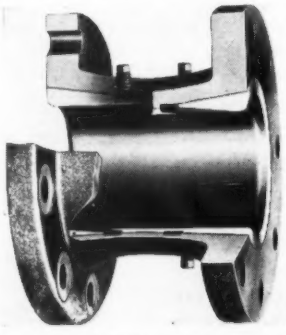
WATTMETER

28 The new Model 900B Volt-Ampere Wattmeter is designed for testing all a c appliances from clocks to 220 v electric ranges. Incorporates a current transformer for additional ranges of 5,000 and 10,000 watts, and 65 and 130

amp. Tests appliances under actual use conditions. Shows wattage consumption, amperes and line voltage. A new continuity test consisting of a neon lamp connected between line and load binding posts provides a simple but accurate test for shorts in power circuits. A large 3¾ in. meter scale is clear, legible and most accurate. The low range of 0-100 watts will measure power consumed by the smallest of appliances. Mounted in handy, portable carrying case, it is especially convenient for service men in checking all a c equipment, as a comparison between the rated watts of a piece of equipment, as stated on the name plate, and the actual power consumed while under test gives an overall check. Hickok Electrical Instrument Co.

TUBE FLOW METER

29 To answer the long needed improvement in the measurement and control of fluid flow, there has been developed and tested a device which will revolutionize present methods. It is the Gentile (Gentilly) Flow Tube which makes possible large savings in power, higher product quality, and large



savings in installation. The Flow Tube consists essentially of a short length of pipe equipped with two groups of pressure nozzles around the inner periphery—one group pointing upstream, the other downstream. The nozzle groups are interconnected by common pressure rings from which connections are made to the high and low pressure sides, respectively, of a standard flow meter. The symmetry of this device permits measurement of flow in either direction. The Flow Tube, it is claimed, offers industry these advantages: It is normally less than 1 pipe dia in length. It can be installed at any section of a pipeline with no straight run limitations. The differential is always a power of the velocity. Therefore, accuracy is constant over the entire range of commercial flow measurement. It offers a negligible resistance to flow. Makes possible large savings in power. Avoids the cost of expensive masonry vaults required for many Venturi installations. For the same range of flow tube to pipe diameter, the flow tube provides a differential greater than that of a Venturi or orifice meter. Consequently, its range for measuring light gases or slow-moving liquids is increased. Flow Tubes can meter gases and vapors with the same facility as liquids. All readings are taken at the same section of flow path thereby causing the usual corrections for internal energy changes to drop out of the flow formula. Accuracy is not affected by assumptions inherent in Venturi or nozzle readings such as: the flow is frictionless and adiabtic; the initial velocity before expansion in a nozzle is zero; the ratio of specific heats is equal to a certain value. Bethlehem Foundry & Machine Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

VOLTAGE STABILIZERS

30 Three new voltage stabilizer units have been added to a standard automatic voltage stabilizer line. The new units are 115 v, 60 cycle designs in 15, 25 and 50 va ratings. They provide a steady output of 115 v (+ 1 per cent for fixed, unity power factor loads) with input voltages ranging from 95 to 130 v. Low case height and

small size make them particularly suitable for shallow depth installations. Other features include totally insulated construction and universal type leads. The latter feature makes these units adaptable to a variety of wiring and mounting arrangements. Maintenance requirements are negligible since there are no moving parts in the stabilizer and operation is automatic. General Electric Co.

CONTACTOR

31 A compact a c and d c reversing contactor designed to control small a c and d c motors used in connection with small hoists, overhead doors, monorail cranes, mechanical speed changers, and other intermittent duty applications is available. This new contactor is extremely compact and consists of double magnet frames and contact blocks with two three-pole armature assemblies mounted on one base and mechanically interlocked. The device has straight line vertical action and despite its small size, has adequate insulation between all live parts and ground to permit direct mounting on a grounded panel. Double break, silver-to-silver contacts eliminate flexible leads, give low contact resistance, and do not require cleaning or dressing. The movable contacts are easily removed by pressing down, turning 90 deg

YOU'LL FIND AIR COSTS LESS

FROM THE FIRST DAY ON

You save with the Worthington YC Compressor—right from the start.

It arrives completely assembled. Installation cost is low, because there's no alignment problem. No erecting engineer needed. Just make the air and power connections and it's ready for work.

You save on space, too. The YC needs only one-half the building space and one-quarter the foundation space of same-capacity horizontals.

There's more operating economy for you in the balanced Y-frame construction for higher rpm and the famous Worthington Feather* Valves—most efficient ever made.

And for years to come you'll benefit from maintenance savings. Valves are unusually accessible; openings are large for quick inspection; spare parts are smaller, less expensive. And finally, you'll always pay less for power, due to the YC's instantly responsive 3- and 5-step *variable capacity control.*

WRITE FOR DETAILS

that show how Worthington YC Compressors can reduce your air costs. Bulletin L-667-B1A has the facts that prove *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, New York.*

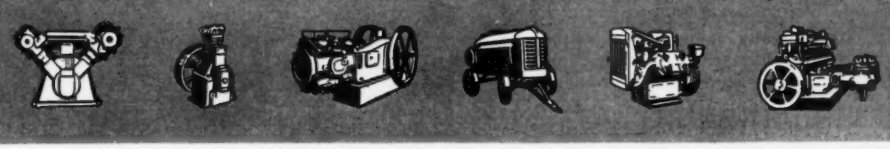
WORTHINGTON

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

*Reg. U. S. Pat. Off.

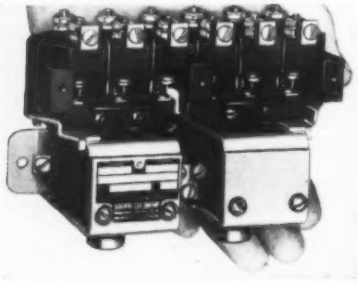
K8-4

Y-Types | Vertical | Horizontal | Portable | Radial | Gas-Engine Compressors



New Products and Methods

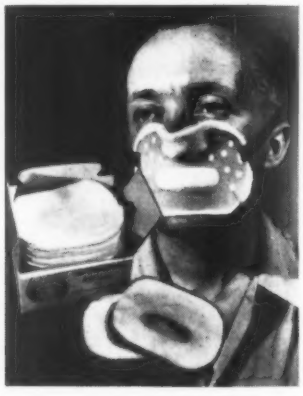
and lifting out. Normally open electrical interlocks can be provided for three-wire control by means of an interlock bar which is easily mounted by means of three screws. Coil removal is provided by the contactor's split magnet frame and pulling



coils from magnet armature. The yokes and contact block are made of non-carbon tracking melamine. They can be used with a c polyphase motors rated not more than 1 hp and with a c single phase and d c motors rated not more than ¾ hp. Industrial Controller Div., Square D Co.

PROTECTIVE MASKS

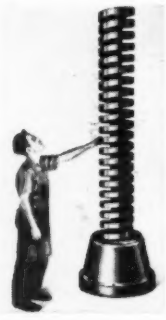
32 G-S protective masks consist of a plastic shield, held in position by an adjustable elastic head band, and replaceable laminated filters of extra thickness. They protect throat, nose and bronchial tubes from larger particles



of non-toxic dusts causing discomfort and increased susceptibility to infection. Masks weigh less than ½ oz. G-S masks are particularly recommended for use in foundries; cement, lime gypsum, talc and similar plants; in machine shops, factories, farms, mills, everywhere except when fine silica dust, lead, arsenic and other toxic dusts are present. Price 25 cents each. General Scientific Equipment Co.

INSTRUMENT CABINET

33 Among the packaged unit instrument cabinets offered by this firm. One, with two designs is described as suitable for almost universal application with industrial or commercial air conditioning systems. In appearance the two cabinets are almost identical. Each has an electronic temperature indicator, above a key-switch panel by means of which the indicator is connected with numerous resistance bulb circuits, for measuring temperatures at various points. But while one measures only dry bulb temperatures, at 28 points in certain rooms, the others will measure both temperature and dew point, at 32 different places, including large rooms, offices, halls and cafeterias. The indicating instrument has a dual range, the outer scale being for dry bulb temperature and the inner scale for dew point temperature, as determined by Dewcel measuring elements. For either reading, at any of the points where the bulbs are located, the Chief Engineer simply flips one of the key-switches; or he can scan all 32 points in succession. The packaged unit described is 80 in. high, 20 in. wide and 15 in. deep, of cold rolled steel, and fully enclosed. Steel doors at the back give access to the wiring, all of which is done at the factory, so that only external connections are necessary when the cabinet is installed. Unit is finished in grey enamel with maroon trim. Foxboro Co.



VIBRATORY FEEDERS

34 A new way of elevating or of lowering various types of bulk materials—foodstuffs, chemicals, articles, etc. —w ithou t using buckets, sprockets, gears, chains and motors. Controlled vibration to a spiral elevating ramp, as illustrated. Here, highspeed vibration causes the material to flow up and around the ramp at rates controllable by a rheostat or reactor provided with each unit. There is no turning or rotating of the spiral ramp. These Feeders have been developed to a point where they are available in limited heights and diameters. The maximum tonnage required determines the diameter of the spiral ramp. Available for operation from 110, 220 or 440 a c. Syntron Co.

MECHANIZED TRUCK

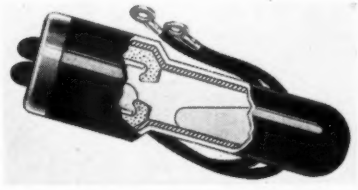
35 The Tri-Truck, mechanized, three-wheel hand truck, is a ruggedly built hard wood and steel general duty hand truck, incorporating a revolutionary telescoping support which adjusts and locks instantly to the correct balance position for any type and weight of load, even with the load on the truck. The Tri-Truck keeps the load balanced, even on rough, wet, or slippery surfaces, or if it strikes a floor obstruction, or if a collision occurs with another hand truck. Once the Tri-Truck is loaded, it is set for use as an easel, on the weighing platform, for movement in elevators, without the need for further loading

and unloading. Time-consuming rehandling of merchandise, and lost motion are dispensed with. Melooz Mfg., Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

MERCURY SWITCHES

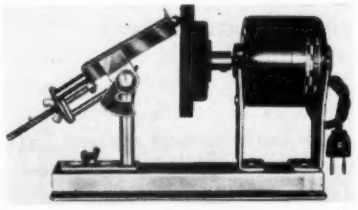
36 New techical developments in the manufacture of Durakool mercury switches have improved performance. An electric weld now seals hydrogen gas under pressure in the metal case of the Durakool switch. The closure keeps that pressure intact whether the switch is in use or inactive on a machine or in stock. There is no noticeable deterioration over periods of many months. The purpose of the hydrogen gas under pressure is to kill the usual arc between the mercury and the contact points of the switch. By killing this arc, corrosion



of the electrode is all but eliminated. Under test, the switches are good for many millions of make and break contacts without any noticeable failure. The metal case acts as one electrode. In its simplified construction there is therefore but one electrode. In the Double Flow model make and break contacts are between two mercury pools, thus further reducing any possibility of corrosion. Models range from 1 to 65 amp in capacity and are made with or without plastic case as standard equipment. Rubber insulations may be had on order. The rubber insulated switch is water proof to all intents and purposes. Durakool, Inc.

DRILL GRINDER

37 Announced is a new precision tool that sharpens the average drill in 30 seconds. The drill grinder comes complete with protractor fixture and spacer that is adjustable to various length drills. The motor is



mounted on a lightweight sturdy metal base, for ease of installation and handling. Drill is adjustable to lengths 1½ in. to 2 or 3 ft as back stop can be removed. Operates on ⅓ hp motor single phase with a 4 in. wheel. Will take drill widths $\frac{1}{32}$ to 1¼ in. Price $22.50. EZ Mfg. Co.

CABLE PROTECTION

38 A new protective coating in an adhesive roll . . . NO-OX-ID Wrap, specially developed to guard lead-sheathed cables in manholes from corrosion, is announced. The new roll product combines two steps in cable protection: a corrosion-resistant coating and a sturdy wrapper. It eliminates separate applications. Wrap is water repellent. Corrosion-inhibitive qualities provide a protective film to keep cable free from pitting. One man can apply it, simply by manually winding the wrap spirally, with

Jenkins PRACTICAL PIPING LAYOUTS 36

How to plan HIGH PRESSURE CONDENSATE FLASH TANK CONNECTIONS

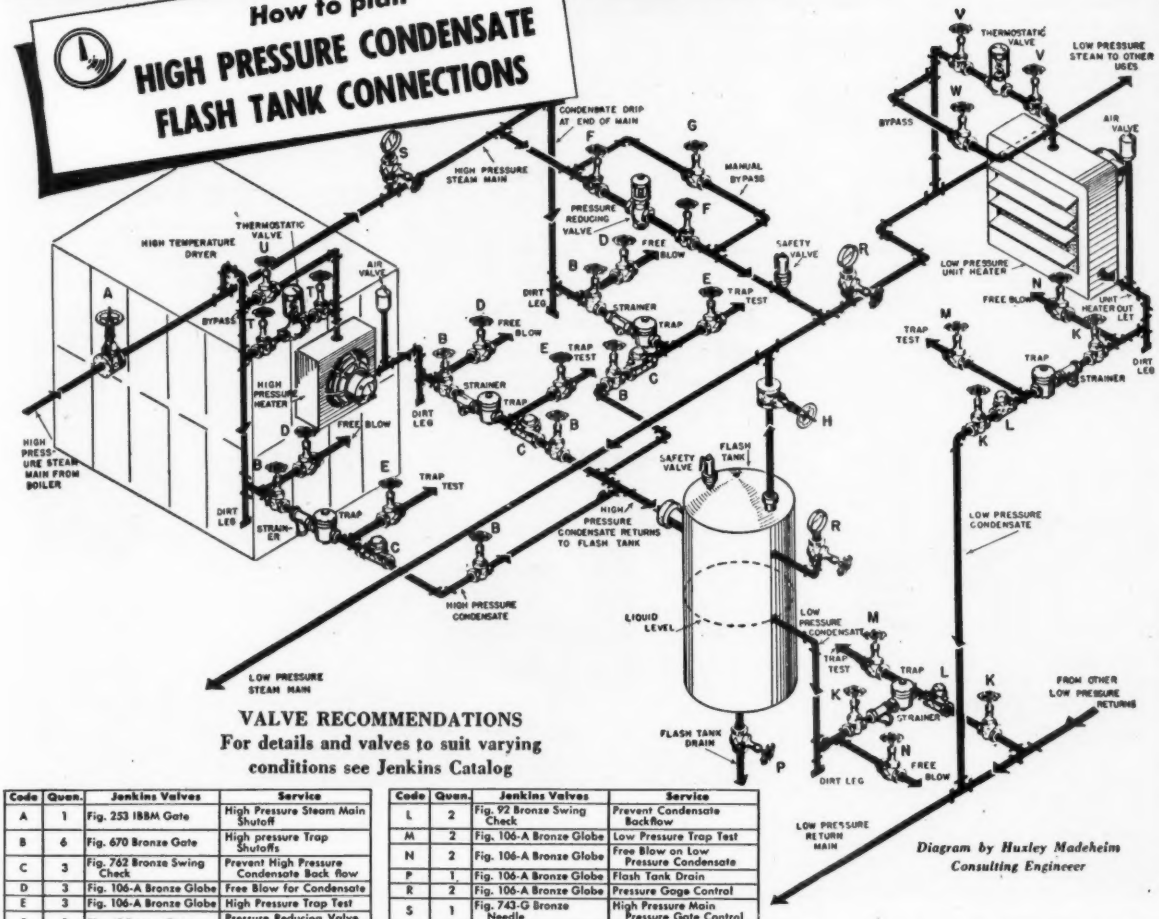


Diagram by Huxley Madeheim Consulting Engineer

VALVE RECOMMENDATIONS

For details and valves to suit varying conditions see Jenkins Catalog

Code	Quan.	Jenkins Valves	Service
A	1	Fig. 253 IBBM Gate	High Pressure Steam Main Shutoff
B	6	Fig. 670 Bronze Gate	High pressure Trap Shutoffs
C	3	Fig. 762 Bronze Swing Check	Prevent High Pressure Condensate Back flow
D	3	Fig. 106-A Bronze Globe	Free Blow for Condensate
E	3	Fig. 106-A Bronze Globe	High Pressure Trap Test
F	2	Fig. 49 Bronze Gate	Pressure Reducing Valve Shutoff
G	1	Fig. 956 Bronze Globe	Manual Control Bypass
H	1	Fig. 651 IBBM Gate	Condensate Flash Steam to Low Pressure Steam Main
K	4	Fig. 370 Bronze Gate	Low Pressure Trap Shutoff

Code	Quan.	Jenkins Valves	Service
L	2	Fig. 92 Bronze Swing Check	Prevent Condensate Backflow
M	2	Fig. 106-A Bronze Globe	Low Pressure Trap Test
N	2	Fig. 106-A Bronze Globe	Free Blow on Low Pressure Condensate
P	1	Fig. 106-A Bronze Globe	Flash Tank Drain
R	2	Fig. 106-A Bronze Globe	Pressure Gage Control
S	1	Fig. 743-G Bronze Needle	High Pressure Main Pressure Gate Control
T	2	Fig. 49 Bronze Gate	Thermostatic Valve Control
U	1	Fig 956 Bronze Globe	Manual Bypass
V	2	Fig. 47 Bronze Gate	Thermostatic Valve Shutoff
W	1	Fig. 106-A* Bronze Globe	Manual Bypass

(*Fitted with Jenkins Throttling Nut, Fig. 344)

A central boiler with only one return main provides steam, in many installations, for a number of buildings spread over a wide area. To prevent disturbances caused by the flashing of the high pressure condensate discharge directly into the low pressure main, a condensate flash tank is usually installed.

Typical use of high pressure steam, in a dryer where it may be required at pressures up to 150 lbs. p.s.i., is shown in this layout. The high pressure condensate is trapped and discharged to a flash tank in which a liquid level is maintained to provide water at all times. This protects the low pressure equipment from destructive effects of "blow through".

A pressure reducing valve system, complete with a three valve by-pass and safety valve, is shown for supplying the low pressure main directly from the high pressure main.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation. Copies of Layout No. 36, enlarged, with additional information, will be sent on request. Just mail coupon.

A CHOICE OF OVER 500 VALVES

To save time, to simplify planning, to get all the advantages of Jenkins specialized engineering experience, select all the valves you need from the Jenkins Catalog. It's your best assurance of *lowest cost in the long run.*

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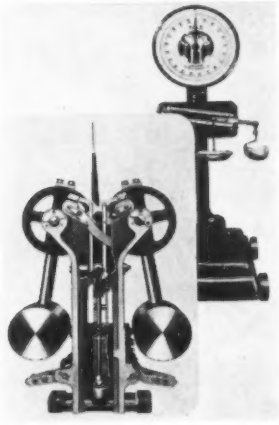
New Products and Methods

a ½ in. overlap, directly around the cable. It slips easily through narrow openings, between cables and narrow duct entrances. Dimensions are ⅛-inch thick, 2 inches wide, 25 ft length. Each roll is cellophane wrapped for film protection, individually packaged. It can be stocked indefinitely, without deterioration. Dearborn Chemical Co.

NEW DIAL SCALE

39 The Magnetrol, a new dial scale mechanism just introduced, achieves for the first time a straight line relationship between the platform load and pointer movement, a reduction of service adjustments from the usual six or seven to only two, full but light engagement between the pointer rack and



pinion by means of a permanent magnet. All moving parts are mounted at three fixed centers in a single gray iron casting. The capacity of the mechanism under direct loading without any lever system is 25 lb; its application to large industrial loads, up to 50 tons is a matter of lever linkage. Guaranteed accuracy is one part in 1000, but accuracies of one part in 2000 are readily obtained. The dial head, which contains a 20 in. dia reading-line dial chart, can be swiveled through 360 deg. Yale & Towne Mfg. Co., Phila. Div.

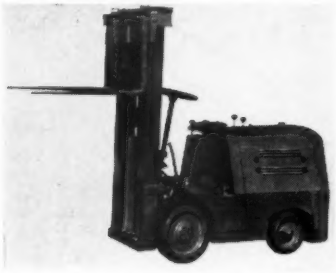
MEASURING SYSTEM

40 A new precision pressure measuring system. Field installations have been completed and in all instances have proven highly satisfactory. The heart of the system is based on applying a differential transformer which develops a linear output to standard primary

measuring elements such as Bourdon Tubes or Bellows (depending upon pressure range). The standard Bourdon Tube when equipped for Atcotran electrical pressure transmission eliminates the so-called inherent characteristics to practically the vanishing point. This is made possible by virtue of the fact that the tube is not loaded with instrumentation gear, the tube is not called upon to accomplish any work, only the Atcotran armature moves slightly. The armature is direct-connected to the Tube tip; no jewel bearings, pivots, springs or similar movements are used. Zero adjustment is embodied in a simple thumb screw, standard on all units. Tubes may be loaded to full rated range and consistently return to zero position within accuracy limitations of the system. Units are accurate to within ¼ of 1 per cent reading . . . sensitivity of 1 part in 4000 or better is usual performance. Any number of pressure transmitters, of either the same or different ranges, may be read from one common indicator equipped with selector switch stations. Pressure pick-up transmitters consisting of K-Monel Bourdon Tubes mounted in dust-tight enclosures are suitable for service on many corrosive applications such as H_2S bearing gas and oil, oxygen NH_3, fluorides, hydrochloric acid, brine and caustic soda. Automatic Temperature Control Co., Inc.

2½ TON FORK LIFT

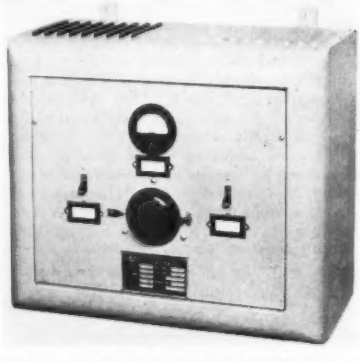
41 Announced is the first of a series of fork lift trucks—Model F50 Shop Mulift. Important features of the lift truck are unobstructed vision when traveling with load and a free lift of 55 in. with an overall height of only



83 in. The 5000 lb capacity F50 is rated at 20 in. from the heel of the forks and has a telescoping lift of 110 in. Other dimensions include overall width—40 in.; overall length less forks 85 in.; overall height with forks down 83 in.; and outside turning radius 88 in. Engine in Model F50 is the same engine as used in Model A3V and A14V Shop Mule Tractors. W. F. Hebard & Co.

SELENIUM RECTIFIERS

42 Heralded is a new concept of unattended battery charging, a new line of efficient, long life, first cost, voltage stabilized, selenium rectifiers is offered for use in sub-station,

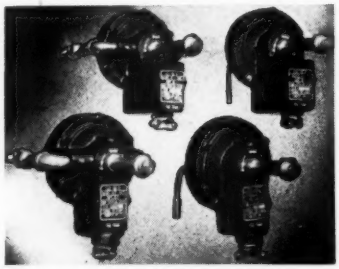


railway signal, fire and burglar alarm systems. The rectifier is made for: wall mounting, floor standing, or panel type installation in colors to the customers specification; current output of 2, 6 and 12 amp; voltage output for from 3 to 60 cell ratings with booster charging feature included; and, for operation on 110 or 220 v, 60 cycle, single phase a c. Safety features include multi-breakers in both d-c and a-c sides. Volt meter is included and ammeters can be provided at extra cost. Stabilization feature insures the battery voltage of 2.15 v per cell regardless of supply line variations. Modifications can be provided to meet the customer's specifications on cabinet and circuit protection features. Industrial Electronics and Transformer Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

PRESSURE CONTROLS

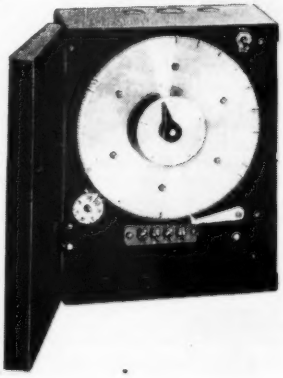
43 These sensitive static pressure controls for application on very low pressures where regulation is required in inches of water either pressure or vacuum. May be used for regulation of



liquid level from slight changes in head pressure, signal or safety device in event of excessively high or low pressures, control the static pressure in the discharge duct of a fan, etc. Units are of small physical size, obtainable in standard ratings ranging from 0 to 20 in. of water pressure or vacuum with range adjustment and with fixed differentials from 0.2 to 2 in. of water. Are available with double throw circuit or floating contacts for use in connection with reversing type damper control motors. Electrical ratings are approved by Underwriters' Laboratories for 10 amp 125 v or 5 amp 250 v, a c. Installation is very simple, requiring only one or two holes to mount on a vertical wall or duct. Coral Designs.

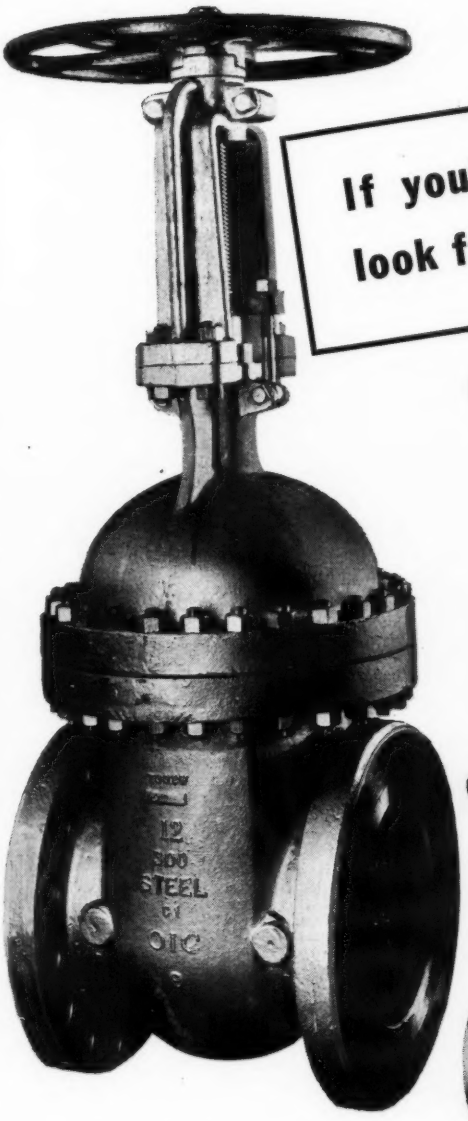
PROGRAM TIMERS

44 A new type TP and TS industrial timers have been designed especially for manufacturing and service establishments where permanent conduit or BX installations in standard switch box cases are desired. Featured is



a dual-disc face which allows exceptional ease of accurately setting up the desired program, but does not indicate the time of day. The model TP is designed primarily for bell ringing or signaling purposes and will make a single circuit contact at any 5 minute interval during a 24 hour period and repeat each day. The ringing period is adjustable from one to thirty seconds. The model TS is an industrial

If you're looking for extra service, look for MONEL in the valves you buy



These stock valves, made to serve in all types of pipe lines, are standard with seats of hard, corrosion-resistant cast "S"* MONEL, to insure longer service life with minimum maintenance. Made by Ohio Injector Company, Wadsworth, Ohio.

• • •

George Automatic Steam Drain Valves are designed for locomotive and steam plant service. The body of this valve is heat-treated "KR" MONEL, operating-spring is cold-drawn MONEL, and the conical closure disk is Type 303 18-8 Stainless Steel. Made by George Manufacturing Company, Phila., Pa.

How would you like valves in your plant that will always work perfectly...valves that will never wear out...valves that will never need maintenance attention? You'd probably describe them as ideal!

Valve manufacturers haven't succeeded in producing these ideal valves—*yet*. But many leading makers have taken a long step toward the ideal by making valve bodies and working parts of MONEL*. For MONEL is one metal that fights the three powerfully destructive enemies of all valves—erosion, corrosion, and abrasion.

MONEL valves and valve parts can give you improved performance in 4 important ways:

1. Fewer mechanical failures. MONEL's exceptional strength, which exceeds that of structural steel, can minimize failures caused by overstressing seats, stems, and other working parts.

2. Less erosion and abrasion wear. Because of its superior hardness, MONEL can substantially reduce damage caused by turbulence, flow erosion, and particle abrasion. With heat-treatable "K"* and "KR"* MONEL, a degree of hardness can be obtained that greatly exceeds that of other non-ferrous alloys. This feature, alone, can sometimes extend valve life by a large percentage.

3. Fewer corrosion worries. Being rust-proof and corrosion resistant, even at high temperatures, MONEL can greatly extend the service life of valves operated under severely corrosive conditions. With fewer replacements and repairs required, valve maintenance costs can be kept to a minimum.

4. Fewer failures caused by heat. MONEL has good heat-resistant qualities, and is satisfactory for service up to 800° F. MONEL is oxidation resistant, and does not embrittle even under continuous high-temperature conditions.

It is because of this remarkable combination of properties that MONEL has been chosen by so many leading valve makers as an industrial "task" metal. You'll find MONEL in many types of fine valves . . . valves designed to give you *extra* service with *minimum* maintenance.

If you would like more information about MONEL as a valve material, write to Bob Johnson, in care of the International Nickel Company. He will be glad to supply you with engineering data and dependable sources of supply.

*Reg. U. S. Pat. Off.

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MONEL...*for minimum maintenance*

New Products and Methods

control timer which incorporates a holding circuit. It closes the circuit on the first impulse and opens it on the succeeding impulse. It has innumerable industrial and assembly line uses where power is consumed. Montgomery Mfg. Co.

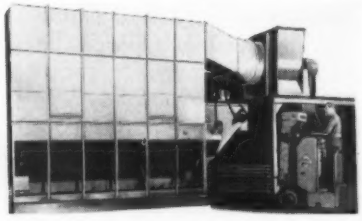
PARTS FINDER

45 Flex-O-Pic, a specialty tool for hard-to-reach parts and places, has just been put on the market. The shaft is flexible cable such as is used in speedometers and dental equipment and

is encased in a flexible housing with expanding and retracting fingers which enable it to reach in and grab a tight hold on anything . . . with enough flexibility to work around corners or S-turns. Emco Enterprises.

ARRESTER UNIT

46 A new 30,000 cfm Centri-Merge Swirl Type Arrester made of stainless steel is announced. Maker asserts that the all stainless steel construction guarantees longer, corrosion-free oper-



ation, with a minimum of long-range maintenance costs. The unit is said to remove dust and dirt from shakeout stations, sand handling and conditioning systems. Sludge disposal is by a skid on a lift truck. The conveyor drive is on top of the conveyor spout. Schmieg Industries, Inc.

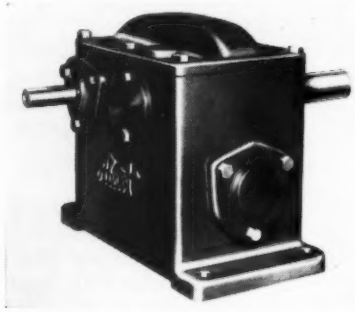
SILICONE RUBBER

47 Announced are the gaskets, diaphragms, grommets, washers, seals and packings, and numerous other extruded and molded shapes and products now available made from Silicone rubber.

Silicone rubber looks and in many ways acts like conventional rubber, and it retains rubber-like qualities and elasticity at extreme temperatures, from 150 to 500 F. In addition to being suitable for dielectric applications, Silicone rubber parts are resistant to permanent compression even under extreme heat, and withstand the effects of prolonged weathering. They have excellent water repellency, and also resist lubricating oils and some chemicals. Stalwart Rubber Co.

SPEED REDUCERS

48 This 225-DW double reduction worm gear reducer torque rating 1,000 inch pounds. Type 300 of the DW series has a torque rating of 2500 in. lb. Features are nickel bronze worm wheels; case-hardened and ground alloy



steel worms integral with shafts; high-speed and intermediate shafts of alloy steel hardened and ground, mounted on ball bearings; bronze bearings on slow speed shaft. Input and output shafts can project on either or both sides. Shafts may operate in either direction. In Types DWU the output shaft is up, with input shaft projection on either or both sides. Housing is of rigid semi-steel, dust-proof and oil tight. Cover can be removed for inspection of worm and wheels without disturbing alignment. Another series is Type 150-DWP, especially efficient in a wide range of small duties. Abart Gear & Machine Co.

FLOW CALCULATOR

49 Those men who are called upon to calculate final pipe diameters, air volumes, static loss and other air flow figures can save time with this air flow calculator. The calculator is of the

nomogram type, arranged circularly and using both sides for calculations. The diameter is 6 in. A very small portion of the calculator can be used to figure out the size of this company's dust collectors for a specific cfm with either 2 to 1 or 3 to 1 free cloth area. This element does not obtrude. The use of both sides and the 6 in. dia of the calculator permits the use of large, clear, easily read scales. Northern Blower Co.

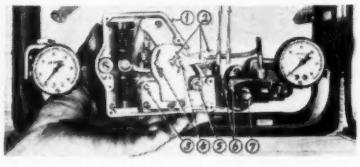
TEXTILE UNIT HEATER

50 Announced is the availability of the new Textile Thermolier. This new Textile unit heater is offered after laboratory and practical field testing as an efficient answer to the re-

quirement for a unit heater that can maintain its heat transfer capacity under adverse operating conditions in textile mills with a minimum of cleaning maintenance. The conventional finned surfaces used in unit heaters that are subject to rapid clogging have been eliminated in the design of the Textile Thermolier and replaced with heat transfer surfaces of an entirely new design and having smooth contours. Removing lint, and fly dust from this new unit heater requires only a jet of air from a compressed air hose or from a portable electric hand blower and takes but a few minutes. The new unit is offered in one size with a heating rate of 113,700 Btu per hour using steam at 2 psi and entering air at 60 F. With steam at 25 psi this same unit delivers 143,400 Btu per hour. Any steam pressure up to 125 psi can be used with corresponding increases in the heat transfer capacity. Grinnell Co., Inc.

PNEUMATIC CONTROL

51 A totally new pneumatic control mechanism is now incorporated into all flow controlling instruments. The housing for this new unit consists of a one piece die casting, result-



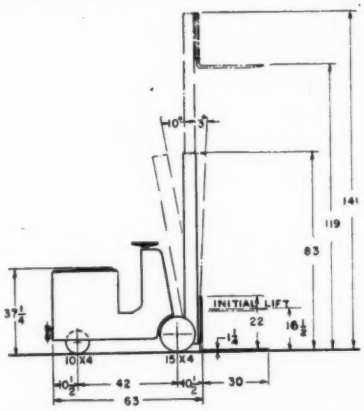
ing in all component parts being maintained in a positively fixed relationship to each other. The entire assembly may be removed from the control instrument for cleaning or repair without disturbing the process. Alignment of pen and index is

USE THE POST CARD

said to be certain throughout the range since both index and input links swing on a common center. Valve action is reversible without altering link relationships. The pen tracks the set point throughout the 0 to 200 per cent throttling range adjustment. Reset is calibrated accurately from 0.2 to 50 min. Fischer & Porter Co.

2000 lb FORK TRUCK

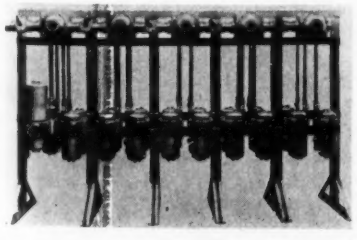
52 Announced is the Type FRH-20 center-control fork truck. In appearance and design it closely follows the FCH 1000 lb capacity fork truck which was described in April. This truck finds application in all plants where narrow aisles, congested areas, limited floor capacity, small and low capacity elevators are a factor and wherever loads can be limited to 2000 lb, 36 in. long. Weight is 3850 lb. This truck has a 42 in. wheelbase,



a 30 in. width, and an overall length exclusive of forks of 63 in. To make a right angle turn the truck requires only 76½ in. plus the length of the load. The travel controller provides three speeds forward and reverse. The circuit is made and broken by a contactor. This controller is interlocked with a foot switch and with the contactor in such a way that the truck may be started only with the controller in first speed when the seated driver depresses the foot switch treadle with his right foot. When the driver removes his foot from the treadle to apply the brake the foot switch causes the contactor to interrupt the circuit cutting off power to the motor. To restart the truck it is then necessary for the driver to bring the controller back to the first speed position with his foot on the treadle. Battery equipment is rated at 36 v and 250 amp hr. Baker Industrial Truck Div., Baker-Raulang Co.

ASSEMBLY SERVICE

53 A new addition to this firm's line is the final assembly of explosion proof control equipment for use in refineries, utilities, and other industries where safe, dust-proof and water-



proof conditions are of first importance. A typical installation is the assembly of five motor control groups, each providing complete control for four motors. This assembly includes junction boxes, sealing fittings, and combination starters, all in explosion-proof, weather-proof, water-tight and dust-proof housings. These assemblies are free-standing, but may be designed for wall-mounting if so desired. This equipment is available with or without instrumentation. This new service is made possible through cooperation with the Crouse-Hinds Co., who manufacture explosion-proof conduit enclosures for all classes of electrical equipment. The firm will design and assemble complete explosion-proof control centers and power panels which will meet the requirements of the National Electrical Code and the most rigid local codes of all installations in the Class 1 and Class 2 hazardous locations. Electro Mechanical Devices Co.

DUST COLLECTOR

54 A line of small, portable, self-contained dust collectors, with air capacities ranging from 550 to 1350 cfm, is announced. The Gem units are available in four sizes and designed to be set close to the source of dust by merely attaching pipe or flexible tube to collector inlet. Gem dust collectors are said to be applicable for filtering and collecting practically all types of industrial dust such as silica, talc, rubber, starch, iron, feldspar, cement, tobacco, zinc, lead and wood. High efficiency of the units prevents heat loss by returning the filtered air to the room. This packaged unit is recommended for use where no central dust collecting system is available and where the air volume for the proper handling of a dust problem is relatively small. Parsons Engineering Corp.

Left — Dust Collector

Right — Telescoping Lift Truck

TELESCOPING TRUCK

55 A new 120-inch telescopic Worksaver has just been announced. The new tilting fork model has a capacity of 3000 lb and was especially designed to make possible maximum use of available headroom in high-stacking operations. The high reach feature, a full ten feet, can be of real value. Such an unusually high reach combined with such a low lowered clearance, 83 in., is accomplished by means of a ram-within-a-ram. When an outer hydraulic piston has fully extended upward, an inner one begins to extend downward, doubling the lift available. The truck travels at 2 mph under full load, lifts 8 fpm with 2500 lb load, and tilts a full 18 deg in 10 sec. Total weight of the truck, including a 19 plate battery, is 3,640 lb. Though battery powered in every respect, it is guided by a walking operator. Dimensions are 33 in wide by 64 in long. Materials Handling Div., Yale & Towne Mfg. Co.

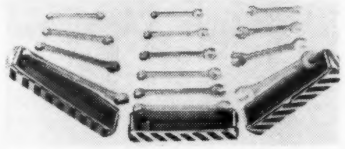
4 WAY PALLET

56 This new four-way, single-faced, all-steel pallet is constructed of special corrugated rolled steel, welded throughout for rigidity and endurance, and built with beveled edges on two sides to permit trucks to ride over easily, and special rolled channel steel face, with center brace for extra weight loads. It is designed for use with power lift and hand trucks. Palmer-Shile Co.

New Products and Methods

END WRENCH SET

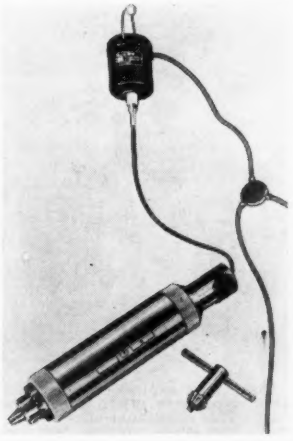
57 Three basic end wrench sets, providing the most-used opening sizes, have been announced. Set No. 3000BA includes four open end wrenches, with openings (in inches) of ¼ and $\frac{5}{16}$, $\frac{3}{8}$ and $\frac{7}{16}$, ½ and $\frac{9}{16}$, and $\frac{5}{8}$ and ¾. All of these eight opening sizes are different. Set No. 1100BA includes four box wrenches, with 12-point box openings of



$\frac{5}{16}$ and $\frac{3}{8}$, $\frac{7}{16}$ and ½, ½ and $\frac{9}{16}$, and $\frac{5}{8}$ and ¾ in. Seven different opening sizes are provided in this set. Set No. 1200BA includes six combination box and open end wrenches, with openings of $\frac{7}{16}$, $\frac{3}{8}$, $\frac{7}{16}$, ½, $\frac{9}{16}$ and $\frac{5}{8}$ in. Each combination wrench has both an open end and a 12-point box opening of the same size. Plomb Tool Co.

FLEXIBLE SHAFT

58 Announced is the availability of the new, No. 17, quick detachable radial handpiece with Jacobs chuck for flexible shaft machines. The new accessory may be used with maker's own line of flexible shaft units or with those made by any other manufacturer. The handpiece is made of a two-piece



aluminum housing with two pre-sealed ball bearings and features a No. 0 Jacobs chuck with 0 to 5/32 in. range. It is cool running and may be attached easily and quickly to the flexible shafting. The handpiece measures 5¼ in. long by $1\frac{7}{16}$ in. diameter and lists for $17.00. L & R Mfg. Co.

TEMP. CONTROLLERS

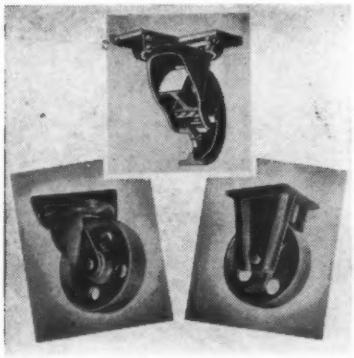
59 A new series of inexpensive temperature controllers designed for use with electric and gas heating units has just been announced. Available with or without pyrometers, these step-less input controllers are suitable for electric and gas furnaces, ovens, pots and other similar applications. Only a small portion of current is allowed through the heating elements, an amount sufficient to maintain definite temperatures. Since no resistance is used, no current is wasted. Gas equipment is controlled through a solenoid valve. The Model IF 4 weighs 5¼ lb and comes equipped with a pyrometer

New Products and Methods

calibrated to 2000 F. It can be supplied for other temperature ranges. Where pyrometer accuracy is not required or where there is a pyrometer already in the installation, the Model IF 2 is furnished. Exactly the same as the IF 4, it is minus the pyrometer and weighs only 3¾ lb. K. H. Huppert Co.

CASTER

60 The wheels on these casters are made of aluminum alloy with higher tensile strength than cast iron, the manufacturer states. This aluminum alloy wheel is satisfactory for use in plants where explosive hazards exist. This is due to the fact that aluminum, while an excellent conductor of electricity, is a metal which will not strike a spark when hitting another metallic object. It has been

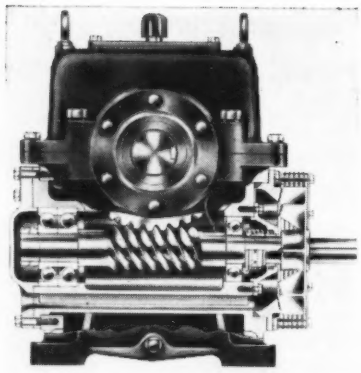


found that many explosions in plants of the above type were often due to static electricity. This aluminum alloy wheel has practically the same carrying capacity as semi-steel or cast iron wheels and can, therefore, be used interchangeably with them.

These casters are available in both swivel and rigid types, equipped with 4 by 2 in., 6 by 2 in. and 8 by 2 in. aluminum alloy wheels. Market Forge Co.

WORM GEAR DRIVES

61 Introduced is a new line of enclosed worm gear drives in both horizontal and vertical types. Hypower units, the manufacturer states, are smaller in size than conventional drives of equal capacity. They deliver power at lower cost and because of their high thermal capacity, they permit the use of a smaller, less expensive reducer which means a savings in original cost. Features are: Increased load carrying capacity is accomplished by means of a new technique in generating gears. Increased thermal capacity is due to the immersion in the oil reservoir of an air channel cylinder. Leakage of oil is prevented by the use of carbon lapped ring type seal. A reduction in size and weight. Hypower worm gear drives



are available in horizontal and vertical types, in a wide range of standard gear ratios to meet practically any need. These units comply with the speed-ratio standards adopted by the AGMA, and the NEMA. Foote Bros. Gear and Machine Corp.

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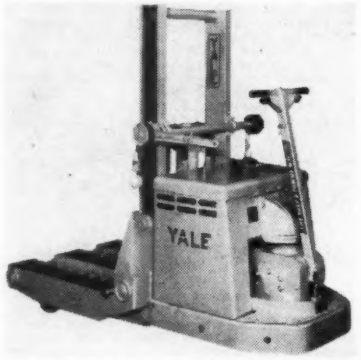
62 Alumatreet is a chemical formula which cleans dirty aluminum and at the same time creates an absorptive crystal coat. The resulting double action also assures a tight paint lock free from blisters and peeling, thereby increasing the life of the paint coating. It protects the treated surface so that if paint is actually scratched it will not permit creep-

ing of the corrosion under the adjacent paint. It gives a ductile non-metallic coating that does not flake even on light gauge aluminum which is readily damaged by bending or denting, and may be used as is with no surface preparation on bright metal and no after drying except wiping with a rag to remove any excess residue. Price $4.00 per gal. Farrelloy Co.

DIE LOADING LIFT TRUCK

63 Announced is a new 4000 lb capacity Worksaver especially designed for handling heavy dies and molds. The electric truck picks up the die or mold at the storage zone, transports



it to the press, lifts it level with the lower platen of the press, and mechanically loads it into position for use. Features which make the truck applicable to these operations are, the three section roller platform, a ratchet-actuated, cable-and-sheave self-loading arrangement, and a high-lift mechanism. Each of two cables is looped over the correct pulley and the cable-hooks are hooked together across the front, or back, of the die. The operator then manipulates the load by means of the ratchet handle at the front of the truck. Yale & Towne Mfg. Co.

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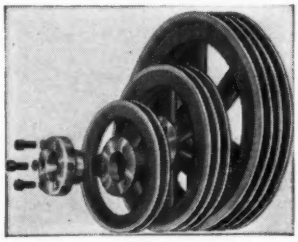
HUB SHEAVE

64 This new sheave enables various diameter rims to be mounted on the same hub, and/or, hubs of different bore to be mounted on the same size rim. Heat treated socket head screws, held securely by lock washers, attach hub and rim together through template drilled holes in the rim web which assures com-

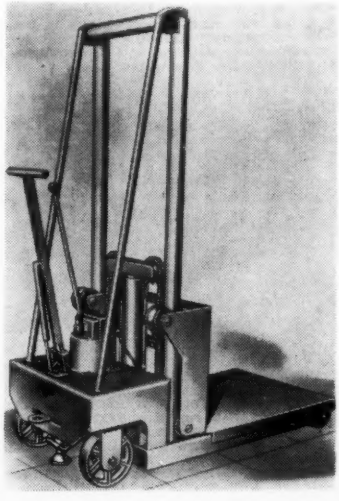


plete interchangeability and quick mounting without special tools. Smaller diameter sheaves utilize fillister head screws. The hubs are bored to shaft size and keyseated. There are no bushings. Perfect fit and concentricity of bore with rim diameter is assured by machining shoulders of the hub and the web face. Sheave rims are made from light weight, stress free, semi-steel castings which are machined and balanced carefully to assure maximum belt life. These sheaves are now available from stock for drives serving 1/3 to 10 hp requirements. They may be obtained in one, two and three grooves for A section belts, also in combination grooves for A or B section belts in sizes from 2.2 in. PD to 18.4 in. PD. Transmission Machinery Corp.

HAND LIFT TRUCK

65 Development of the Leverlift truck for double faced pallet handling is announced. Features of the Leverlift include a set of ingenious toggle booster rollers that float the truck

(Continued on page 49)



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YARWAY IMPULSE STEAM TRAP

Installation of Glass Block Panels

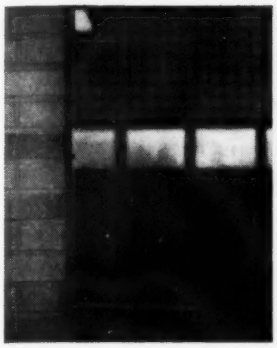


Fig. 1. When chase construction is not possible, panels may be held in place by metal panel anchors, 24 in. long, which extend 12 in. into horizontal mortar joints. Panel anchor construction is limited to 100 sq ft panels

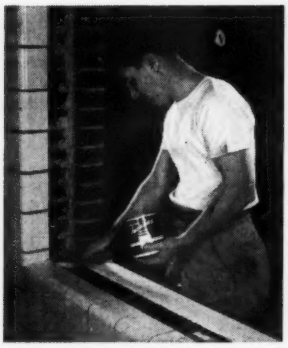


Fig. 2. The first step in installing a glass block panel is to coat the sill with asphalt emulsion in order to allow for movement between panel and sill. This coating of emulsion should be troweled on to a thickness of about 1/32 of an inch

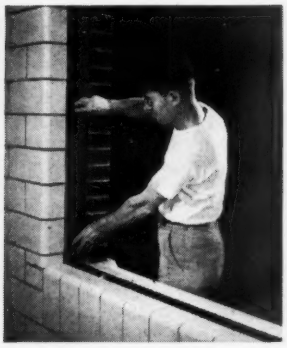


Fig. 3. Having applied the asphalt emulsion to the sill, the mason next sets the glass fiber expansion strips in place in the jambs. The globe of asphalt emulsion, previously applied, will hold the expansion strips in place on the jambs

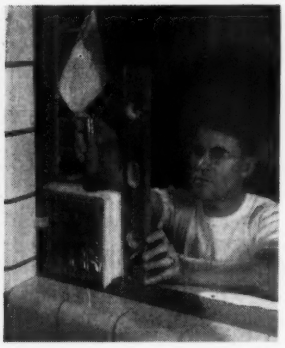


Fig. 4. With the sill buttered with mortar, the mason lines up the first glass block. Temporary wooden wedges, inserted between blocks and chases, hold the block in position while level lines are rigged to true up the first course to be laid

Fig. 5. To build a sturdy, waterproof glass block panel, all mortar joints must be full. It is highly important that the mason crown the mortar slightly in order to fill the corrugations of the block as it is shoved into place on the sill

Fig. 6. For panel reinforcing, welded wire wall ties are imbedded in the center of horizontal mortar joints at regular intervals. Panels of 6 in. block require ties every fourth panel; panels of 8 in. every third course; 12. in., every course

Fig. 7. When panels are held in place by panel anchors instead of chases, anchors must be crimped to allow for expansion. When the anchor is not in line with the glass block mortar joint, the anchor should be bent in order to obtain a fit

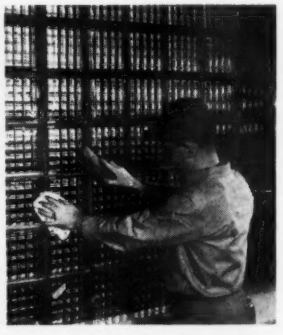


Fig. 8. With all the block in place and the joints tooled to a smooth concave finish the mason gives the panel a second cleaning. Throughout the job he has exercised care in removing excess mortar to ease this final clean-up job

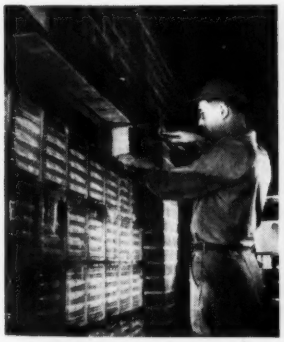


Fig. 9. Before the mason lays the last course of block, expansion strips are stuck to the under side of the lintel. Care is required in inserting this final course to leave clearance between the block and the expansion strip for deflection

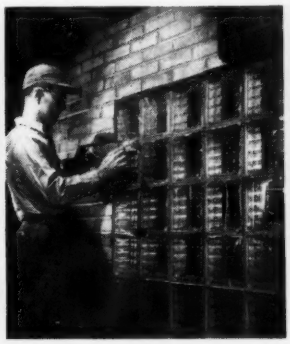


Fig. 10. The last glass block is installed in the manner shown here. It is "buttered" on one side only and carefully slipped into place—usually a two-man job. Then the last vertical joint is tuck pointed with mortar. Pack the mortar solidly

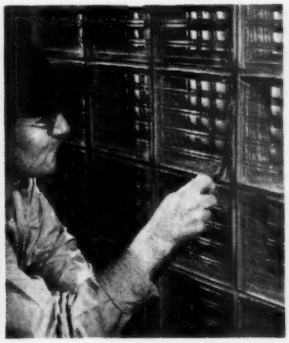


Fig. 11. After the last block has been laid and before the mortar has set, joints should be tooled back to the small lip at the edge of the block. Joints should be concave and finished to a smooth surface. The panel should again be cleaned

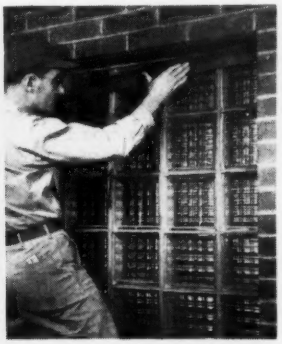


Fig. 12. When the laying of the panel is completed the removable angle is bolted into place across the lintel on the inside of the panel. These angles form a chase which holds the panel securely as the chases hold it at jambs and sill

This series of photographs is taken from the movie "Mortar and Glass" released by Structural Products Company and available for showing before various groups.

Power Circuit Layouts for Heavy Welding

By **MERLE P. SPURRELL,**
Field Engineer,
Bulldog Electric Products Co.

Part I.* In electrical distribution systems for welders, voltage drop is the primary consideration . . . Duty cycles and their calculations . . . Determination of Equivalent Continuous Thermal Load (ECTL) and its relation to the duty cycle and nameplate rating . . . Total load on a group of welders . . . Calculation of voltage drop in transformers

RESISTANCE welding has increased many fold in the past 10 yr. with the result that rapid strides have been made in the design of welding installations. The difference in concept between a power distribution system and a welding distribution system is significant. In designing resistance welder distribution systems two factors are of primary concern: 1, voltage drop; and 2, temperature rise. Normally in the design of power systems, the ampere carrying capacity is the first consideration and voltage drop is secondary. The fact that the distribution system is heavier than necessary to provide the desired voltage at the motors is of little concern.

The opposite is true of welding distribution systems, It is absolutely necessary that voltage regulation be kept within predetermined narrow limits to assure consistently good welds. The welding distribution system should be designed to give the necessary voltage regulation, and only secondary consideration should be given to the fact that the system will, in all probability, be heavier than is necessary to carry the required amperes.

In the first case you buy say, a 1000 amp power system, but for a welding system you should buy a voltage regulation system of 2, or 5 or 10 per cent, depending upon the requirements. Since the voltage drop problem is one of voltage regulation, voltage drop should be expressed in per cent rather than in number of volts drop. Thus a 22-v drop on a 440-v system is 22/440 or a 5 per cent drop. The same voltage drop on a 220-v system would result in a 10 per cent drop. Charts and tables are available to quickly estimate the anticipated voltage drop in any type of distribution system. These will be discussed later after explaining the need for calculating the second factor, temperature rise.

Calculating the heating effect of the welding current is always done for two reasons: 1, to determine the supply transformer size necessary to serve the welding load; and 2, to give a starting point in determining the necessary distribution system.

In order to find the heating effect of a proposed welding load, it is necessary to determine mathematically the continuous ampere load which would have the same heating effect as the pulsating loads of the welding machines which the distribution system will serve. This factor known as the Equivalent Continuous Thermal Load is here abbreviated ECTL. This can be approximated by multiplying the welding kva (during weld) by the square root of the duty cycle. For example: If the duty cycle of a welder were 9 per cent and the kva "On" current during weld were 800 kva, then

$$\text{ECTL} = \sqrt{0.09} \times 800 = 240 \text{ kva} \qquad \text{Eq. 1}$$

More accurate formulas for individual welders are available[1] taking into consideration the varying "On" times of the welders. However, the above formula is accurate enough for, after all, if an ECTL of 340 amp were calculated, a minimum system size of 400 amp would be used for the distribution system.

Table. I. Equivalent continuous loading of typical welding installations

Types of Welding	Equivalent Continuous Load in Per cent of Sum of Name Plate Readings
Spot	
Flash	5 to 10% (usually)
Projection	10 to 20% (rarely)
Hydromatic,	
Butt	10 to 20%
Seam	25 to 70%

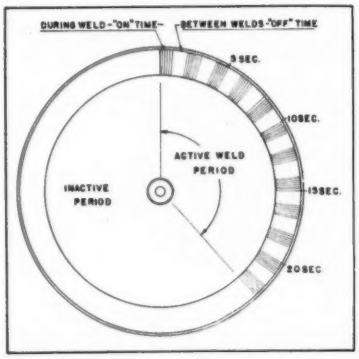


Fig. 1. Time cycle for a sequence of welds. Data of this kind are required to calculate the duty cycle

It will be noticed that the formula is a function of Duty Cycle and "On" current. The current demand of a welder must be calculated from the actual "On" current which does not necessarily have any relation to Name Plate Rating.

Duty cycle is the ratio of time of current flow ("On" time) to the total time required for one sequence of welds including the time of current flow and all time between welds. In other words, duty cycle is the ratio of: the actual "On" current time consumed during the welding of a piece of work, to, the total time consumed between the time one piece of work is placed on the welding machine up to the time the next piece is placed on the welding machine.

For example, for a welding job on which there are several spot welds to be made, the total "On" time for making all of these spots may equal 30 sec. The total welding sequence time or the time which elapses from the time the operator picks up one piece to be welded and the time when he picks up the next piece to be welded may equal 270 sec. The duty cycle is then equal to 30/270 which equals 1/9 or 11.1 per cent.

Welding sequence of a welder job is often shown by a diagram similar to Fig. 1. The duty cycle is obtained by adding the total time consumed by the dark areas divided by the time represented by the entire circle. Since the inactive periods on most welding jobs are variable, it is generally better to estimate the duty

* This is the first part of a two part article. The second part dealing with detailed calculations for an installation of six welders of various types will appear in the November issue.

[1] See the Resistance Welding Manual published by the Resistance Welder Manufacturers Assn. and AIEE Report No. 41-82, Power Supply for Resistance Welding Machines, Part 3 by Lee Clark of the Detroit Edison Co.

cycle over a longer period of time than one welding sequence. A good period of time for estimating purposes is one hour. Duty cycle would equal the number of cycles in total "On" time per hour over the total number of cycles per hour. The total number of cycles per hour would be 60 x 60 x 60, inasmuch as there are 60 cycles in a second, 60 seconds in a minute, and 60 minutes in one hour.

As an example, we may have a job in a plant where the frequency of the distribution system is 60 cycles. The current flow "On" time per each weld equals 3 cycles. The total number of welds per hour which would be made on the machine equals 7200. Then the total "On" time per hour would equal 3 cycles per weld times 7200 welds or 21,600 cycles "On" current time per hour. The total number of cycles in an hour equals 60 x 60 x 60 or 216,000. The duty cycle of this machine would then equal 21,600/216,000 which is 0.10 or 10 per cent.

Logically, it would seem as if the total ECTL of a large number of machines would be equal to the sum of the ECTL of the individual machines. However, it has been found by the Detroit Edison Co.[1] after measurements made on a large number of installations that the total of a group of machines is closely approximated by taking 100 per cent of the ECTL of the largest machine and adding 60 per cent of the sum of the ECTL's of the rest of the machines.

Very often, accurate information is not available on a new installation and it is well to know the maximum ECTL that could be imposed on the distribution system. The name plate kva of a welding machine is not the thermal capacity of the transformer of the welding machine. The name plate kva is maximum "On" current that can be imposed on the welding machine transformer at a 50 per cent duty cycle with the "On" time not exceeding 1 min.

In other words, a 100 kva machine can, without exceeding the thermal capacity of its transformer, draw 100 kva "On" current if "On" current time does not exceed 1 min. and the "Off" time between welds is at least 1 min.

The Name Plate Rating or NPR, is obtained by multiplying the continuous rating, CR, of the transformer by 1.414 Thus

$$NPR = CR \times 1.414 \qquad \text{Eq. 2}$$

or conversely

$$CR = 0.707 \times NPR \qquad \text{Eq. 3}$$

$$= \sqrt{.50} \times NPR$$

This formula is a variation of Eq. 1 which in more general terms is

$$ECTL = \sqrt{\text{Duty Cycle}} \times \text{"On" current} \qquad \text{Eq. 4}$$

The maximum ECTL of a transformer would naturally be its continuous rating. The continuous rating or maximum ECTL of a transformer would equal the square root of the maximum duty cycle (which by definition is 50 per cent) times the maximum "On" current which could be carried at this duty cycle (which by definition is the name plate rating). The square root of 50 per cent or 0.50 is 0.707. So Eq. 1 is equivalent to Eq. 4 and it may be said the maximum ECTL of an individual welding machine could not exceed 0.707 of the name plate rating.

From experience it is known that the total ECTL of a group of welders usually approximates 100 per cent of the ECTL of the largest welder plus 60 per cent of the sum of the ECTL's of the rest of the welders so the maximum possible ECTL of a group of welders may be estimated from

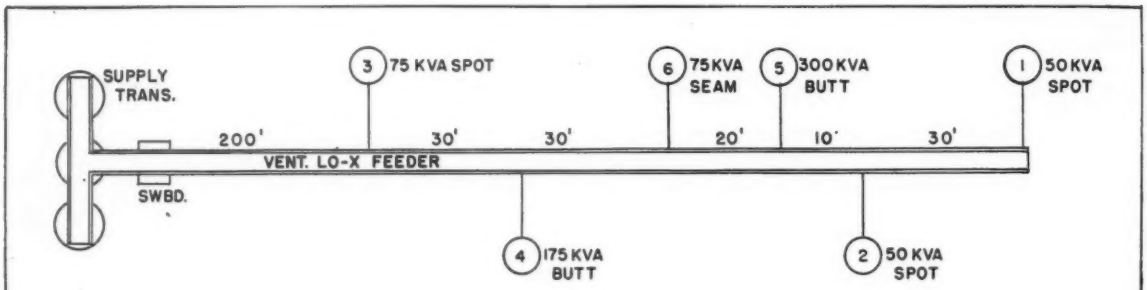
Max. Total ECTL =
0.707 (NPR of the largest + 60% of the sum of the NPR's of balance) Eq. 5

Actually, welding machines operate at an ECTL below the thermal capacity of the transformer and the actual total ECTL of a group of welders will usually be well below

Table II. Approximate voltage drop calculations for industrial distribution systems covering transformers, ducts and cables

Equipment Characteristics	Volts Drop at Rated Current Per 100 Foot Run											
	100% Load PF Lighting Load		95% Load PF		90% Load PF Comb. Lighting and Motors		70% Load PF Motor Load		50% Load PF Small Welder		30% Load PF Large Welder	
	3φ	1φ	3φ	1φ	3φ	1φ	3φ	1φ	3φ	1φ	3φ	1φ
TRANSFORMER*												
120 volt 5% Imp.	1.3	1.3	3.0	3.0	3.7	3.7	5.0	5.0	5.8	5.8	6.0	6.0
208 volt 5% Imp.	2.3	2.3	5.2	5.2	6.4	6.4	8.7	8.7	10.0	10.0	10.4	10.4
240 volt 5% Imp.	2.6	2.6	6.0	6.0	7.4	7.4	10.1	10.1	11.5	11.5	12.0	12.0
480 volt 5% Imp.	5.3	5.3	12.0	12.0	14.8	14.8	20.2	20.2	23.0	23.0	24.0	24.0
600 volt 5% Imp.	6.6	6.6	15.0	15.0	18.6	18.6	25.2	25.2	28.8	28.8	30.0	30.0
LO-X DUCTS	2.2	2.0	2.6	2.4	2.7	2.5	2.8	2.6	2.7	2.4	2.5	2.2
PLUG-IN DUCTS												
250-1000 Amp.	2.7	2.5	4.5	4.1	5.2	4.6	6.4	5.6	6.9	6.0	7	6
1350-1600 Amp.	1.9	1.6	3.9	3.4	4.1	3.5	5.2	4.5	5.4	4.7	5.5	4.8
CABLES IN CONDUIT												
750-1000 MCM 400-455 Amp.	1.4	1.6	2.4	2.8	2.8	3.2	3.5	4.0	3.7	4.3	3.7	4.3
300-500 MCM 240-320 Amp.	1.8	2.1	2.5	2.9	2.7	3.1	3.1	3.6	3.1	3.6	3.0	3.5
4/0-250 MCM 195-215 Amp.	2.0	2.3	2.6	3.0	2.7	3.1	2.8	3.2	2.8	3.2	2.6	3.0
1/0-3/0 125-165 Amp.	2.4	2.8	2.8	3.2	2.8	3.2	2.7	3.1	2.5	2.9	2.1	2.4
3-1 80-110 Amp.	3.1	3.6	3.3	3.8	3.3	3.8	3.0	3.5	2.5	2.9	2.0	2.3
8-4 40-70 Amp.	4.4	5.1	4.2	4.9	4.0	4.6	3.2	3.7	2.3	2.7	1.4	1.6

*If transformer is 4% instead of 5% impedance, take 4/5 of values shown.
If duct or cable is half loaded, take half of value shown, etc.
For uniformly distributed loading, take half the value shown because the load center would be at the midpoint in the run. Plug-in ducts are designed for uniformly distributed loading and thus, half the value shown can be used except where the distribution is known to be otherwise.



NO.	NAME PLATE KVA	TYPE	P.F.	KVA DUR. WELD	CYCLES PER. WELD	WELDS PER SEQUENCE	SEQ. PER HR.	DUTY CYCLE	EQUIV. CONTINUOUS THERMAL LOADING
1	50 KVA	SPOT	60%	90 KVA	15	4	240	$\frac{15\times4\times240}{216000}=6.66\%$	$90\times\sqrt{.066}=23.1$ KVA.
2	50 KVA	SPOT	60%	120 KVA	15	6	200	$\frac{15\times6\times200}{216000}=8.3\%$	$120\times\sqrt{.083}=34.6$ KVA.
3	75 KVA	SPOT	50%	150 KVA	20	10	150	$\frac{20\times10\times150}{216000}=13.9\%$	$150\times\sqrt{.139}=55.9$ KVA.
4	175 KVA	BUTT	30%	525 KVA	300	1	40	$\frac{300\times1\times40}{216000}=5.5\%$	$525\times\sqrt{.055}=123$ KVA.
5	300 KVA	BUTT	30%	600 KVA	600	1	30	$\frac{600\times1\times30}{216000}=8.3\%$	$600\times\sqrt{.083}=172$ KVA.
6	75 KVA	SEAM	50%	75 KVA	2	15 WELDS/SEC (CONT.)		$\frac{2\times15\times60\times60}{216000}=50\%$	$75\times\sqrt{0.50}=52.5$ KVA.

Fig. 2 Typical industrial welder installation and calculations which will be worked out in detail next month in Part II

this figure except for special cases such as seam welders on continuous duty. Table I gives the approximate equivalent thermal loadings of typical welding installations.

In figuring voltage drop, the system should be divided into three parts: 1, the high voltage system; 2, the power supply transformer; and 3, low voltage feeder. The last two constitute the greatest problem.

The sum of the percentage voltage drop in each of the three should be less than the allowable voltage drop required for the particular installation. The percentage regulation of the high voltage system can usually be obtained from the power company. The percentage voltage drop in the power supply transformer and the low voltage feeder must be calculated for each machine separately.

Voltage drop in the power transformer is a function of the impedance of the transformer. In order to determine the percentage drop in the power supply transformer, it is necessary to ascertain: the actual "On" current kva of the welder, or, group of welders, if simultaneous welds of a group of welders is under consideration; the supply transformer name plate kva and phase characteristics; and the percentage impedance. If the welder load is single phase and the supply transformer is single phase the voltage drop, as a percentage, is

$$\% \text{ VD} = \frac{A \times B}{C} \qquad \text{Eq. 6}$$

where

A=Kva (during weld)

B=Supply transformer % impedance (name plate)

C=Supply trans. kva (name plate)

For example, if in a particular problem the "On" current were 800 kva, and the power supply transformer bank has a 600 kva rating, single phase, with an impedance of 2.5 per cent, then the voltage drop equals

$$\frac{800 \times 2.5}{600} \quad \text{or } 3.33\%$$

If "On" current is expressed in amperes, the transformer rating must be expressed in amperes.

If the welder load is single phase and the supply transformer is three phase then

$$\% \text{ VD} = \frac{A + B}{C} \times 2 \qquad \text{Eq. 7}$$

where A, B and C are the same as in Eq. 6.

Voltage drop in the low voltage feeders may be easily calculated from the use of voltage drop charts which are available for all types of conductors. Application of these charts and calculations to a specific example will be covered in Part II.

● **For Bacon and Ham . . .** A graphic presentation of a meat smokehouse was enabled through the judicious and skillful use of plastics. This model incorporates working parts and is one-third the size of the actual smokehouse produced by Atmos Corp., Chicago. Gerhard Kohler, head of the Barnes & Reinecke model department is pointing out features of the smokehouse

SOLDERING Can Be Easy

Principles involved . . . Proper sizes of soldering irons . . . Preparation of surfaces . . . Soldering of parts and of wiring . . . Use of an open flame . . . Application of carbon clamps . . . What flux to use and where and how to use it . . . Practical use of the electric soldering iron

By JOHN FOSTER, Maintenance Engineer

IN ORDER TO learn good soldering technique it is absolutely necessary to understand the fundamentals of soldering. First, enough heat must be transmitted to the metal or metals being soldered to raise their temperature to the melting point of the solder being used. A solder's melting point will depend upon the alloy composition of the solder.

Since all metals absorb heat in proportion to their volume, the larger the object being soldered the more heat will be required. Metals also lose heat through radiation.

Hence, the greater the area of metal exposed the faster the heat will be dissipated and the more heat will be needed to make up this loss.

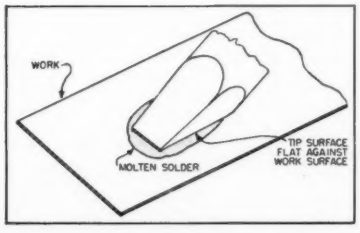


Fig. 1. Applying soldering iron like this will insure maximum amount of heat being transmitted to work

The size of soldering iron required to provide adequate soldering heat will be governed, therefore, by the size, shape and metal of the object to be soldered. Large objects require more heat than do small ones; sheet metal parts loss heat more rapidly than do parts that are solid; and such high heat conducting metals as copper, brass, aluminum, lose heat faster than do lower heat conducting metals such as iron, steel, lead

The following suggestions may serve as a guide in determining the correct iron sizes to use for various kinds of work: For very light soldering jobs use a pair of ½ lb coppers (two coppers totaling ½ lb) or an electric soldering iron up to 70 watts in size. On medium soldering, such as light tinware, wiring, etc., a pair of 2 lb coppers or an electric iron between 150 and 175 w is satisfactory. Where medium tinware, light ventilating ducts, roofing, gutters, are to be soldered a pair of 3 lb coppers or a 225 to 275 w electric iron may be used. For ordinary weight roofing, copper and galvanized iron, heavy tinware and automobile repairs a pair of 4 lb coppers or an electric iron between 325 and 375 w will prove adequate. Where soldering involves heavy sheet metal work, plumbing, etc., it is advisable to employ a pair of 5 lb coppers or an electric iron having a rating of 475 w or more.

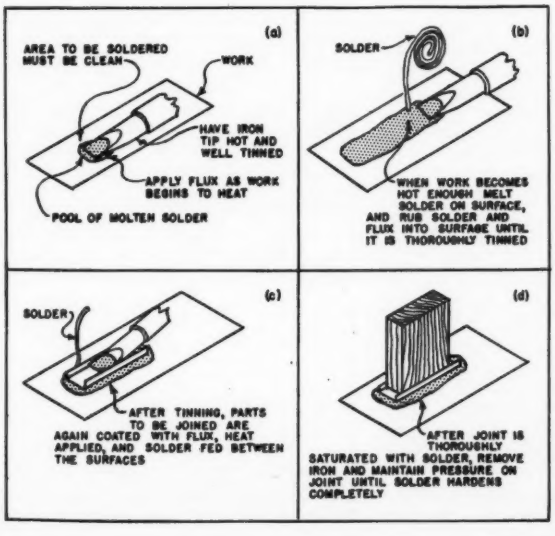

(a)
AREA TO BE SOLDERED MUST BE CLEAN
WORK
HAVE IRON TIP HOT AND WELL TINNED
APPLY FLUX AS WORK BEGINS TO HEAT
POOL OF MOLTEN SOLDER
(b)
SOLDER
WHEN WORK BECOMES HOT ENOUGH MELT SOLDER ON SURFACE, AND RUB SOLDER AND FLUX INTO SURFACE UNTIL IT IS THOROUGHLY TINNED
(c)
SOLDER
AFTER TINNING, PARTS TO BE JOINED ARE AGAIN COATED WITH FLUX, HEAT APPLIED, AND SOLDER FED BETWEEN THE SURFACES
(d)
AFTER JOINT IS THOROUGHLY SATURATED WITH SOLDER, REMOVE IRON AND MAINTAIN PRESSURE ON JOINT UNTIL SOLDER HARDENS COMPLETELY

Fig. 2. Here are the four steps, explained in the text, to follow when soldering parts together

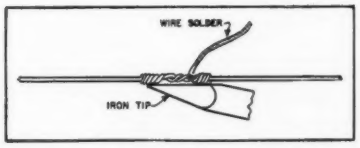


Fig. 3. Wire connections may be soldered in this manner

When sufficient heat is applied to the metal being soldered, the temperature of the metal will reach the point where it will melt the solder on contact and form a tight bond with the solder by actually dissolving slightly in the molten solder. This is the ideal condition for soldering and the only one that will insure a solid soldered joint.

The second essential requirement for good soldering is cleanliness of the parts to be soldered. Solder will not alloy itself to a metal surface that is not entirely free of oxide, dirt, grease or any other non-metallic coating. Since all metals oxidize on exposure to the atmosphere, oxides are present on all unprotected surfaces and they must be removed before soldering can be successfully done.

In preparing a metal surface to be soldered, first clean it thoroughly. Depending upon the metal's condition, this may be accomplished with a grease or paint solvent or by means of scraping, filing, wire brushing, sandpapering, etc. When the surface has thus been thoroughly cleaned it will be ready for soldering.

The next step is to have the coppers or electric iron properly "tinned." The soldering tip must have a coating of tin or solder in order to protect it from oxidizing. If the tip is not tinned a non-conducting crust will form and prevent the proper flow of heat to the work. If the tip requires tinning, file the surfaces down to clear copper while the iron is hot. Then melt a little solder on a piece of clean tin can metal, apply flux to the tip surfaces, and rub them in the molten pool of solder until a uniform coating is produced on all the working surfaces.

Some electric soldering irons have copper tips that are armor clad with

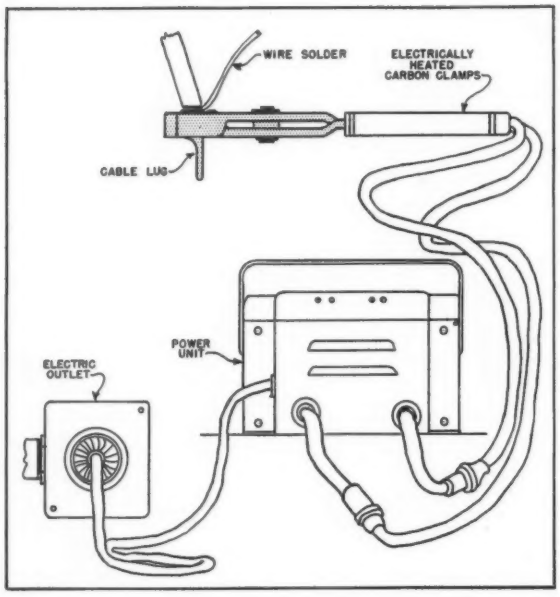


Fig. 4. This drawing shows one way in which to make a hook-up using carbon clamps, electrically heated

a metal more durable than copper, and which can be tinned easily. Such tips should never be filed as this will ruin the protective sheathing. When necessary, they may be scraped lightly to prepare them for tinning.

Now, with the copper or soldering iron tinned, apply it to the work as shown in Fig. 1. This will insure the maximum amount of heat transmission. Then melt a small quantity of solder with the iron so that the iron tip rests in a pool of molten solder. This will greatly aid the transfer of heat from the iron to the work. When the work begins to heat up apply flux to the part to be soldered, being sure to cover the entire area and a ¼ in border beyond. If flux-cored solder is used, wait until the work reaches a temperature sufficient to melt the solder. Then apply solder in small quantities, rubbing the molten solder and flux into the surface of the work unit it is thorougly tinned.

Sometimes plating on the work will cause difficulty in tinning it. This is especially the case where parts are cadmium plated. When such difficulty is encountered, scrape or file the plating away from the areas to be soldered.

All part surfaces that are to be joined by soldering should be carefully tinned as explained. The parts should then be again coated with flux and assembled in position, and the iron applied to the top part with pressure. When solder melting temperature is reached apply solder in small quantities, allowing it to flow freely between adjoining surfaces of the work. This is called "sweating." Continue adding solder, and maintaining pressure on the work with the iron, until no more solder is absorbed between the soldered surfaces and the solder builds up slightly outside the soldered joint. Then apply pressure to the work with a stick or other object, to hold the pieces together until they cool, and remove the iron. All these steps are shown in Fig. 2. Extreme caution is necessary to avoid the slightest movement of the soldered parts until the solder has completely solidified, otherwise fracture of the solder bond is certain to occur. Usually the color of the solder takes on a whitish tint as it solidifies, but it should be borne in mind that the interior of the solder is the last to solidify and, therefore, adequate time should be allowed before releasing pressure on the joint.

In soldering wire connections and similar pieces of work, hold the tip of the iron against the under side of the area to be soldered, as shown in Fig. 3, instead of on top. This will permit the work to heat quickly, so that when the flux and solder are applied to the top surface of the work the solder will liquefy and flow down through the interstices of the joint, thoroughly coating all exposed surfaces and effectively protecting the junction from oxidation.

Sometimes it is desired to utilize an open flame, such as a blow torch, acetylene torch, gas stove, oil stove, or even, where only a small amount of heat is required, the flame from a kerosene lamp, candle or match. In this case, care is necessary to avoid oxidation or carbonization of the work, as this makes it more difficult for the flux to clean the work properly. When an open flame is used for tinning parts to be soldered, the flux and solder may be spread with a wire bristled brush or a ball of steel wool.

A very effective method of soldering that can be used for certain applications, consists in using electrically heated carbon clamps that operate from a low voltage transformer as shown in Fig. 4. The current flowing between the carbon jaws of the clamp heats the metal being soldered. Actual soldering with this method is similar to soldering with coppers or an iron.

The selection of fluxes is an important detail in soldering. Where the flux is contained in wire solder generally two types are available, resin core and acid core. When plain wire or bar solder is used the flux is applied separately.

Resin flux comes in lump form and may be used as a powder or dissolved in alcohol. This is a relatively weak flux but is non-corrosive and non-inductive, and hence best for electrical connections, since it won't corrode the connections and won't affect the properties of insulations. It is necessary that work be especially clean where resin flux is employed.

Zinc chloride flux is used to a considerable extent in general soldering, other than electrical work. It is an acid flux, consisting of muriatic acid saturated with pure zinc. This flux is corrosive and must be washed off soldered work to prevent corrosion. This precaution applies to most fluxes, except resin. Zinc chloride flux is also available in paste and crystalline form, the latter being dissolved in water for use.

Where galvanized steel is to be soldered, full strength muriatic acid should be used and time should be allowed for it to dissolve the zinc coating before soldering is started.

While muriatic acid may also be used as a flux when soldering stainless steel, better results will be ob-

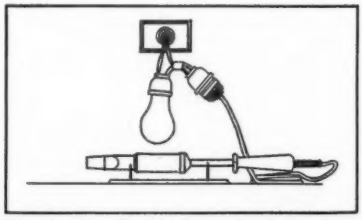


Fig. 5. An electric lamp is shown here being used as a fixed resistance in the circuit with an electric soldering iron

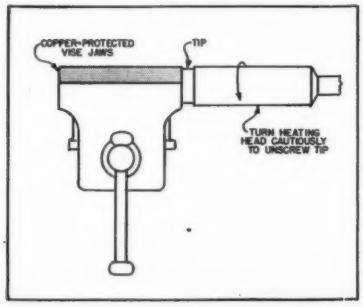


Fig. 6. This is the correct method of removing the tips from soldering irons

tained if a special stainless steel flux is employed. This should be removed, after soldering, with water containing 10 per cent washing soda.

Aluminum is generally considered a difficult metal to solder, but it can be soldered successfully if the proper flux is used.

Never use a stronger flux than necessary. The mildest and weakest flux that will insure a good soldered joint is the kind to use. Experience will teach the best kind and strength of flux to use for each type of soldering job.

In general, the use of an electric soldering iron or carbon soldering clamps is preferable to any other method of providing heat, though some mechanics prefer to use soldering coppers. Electric soldering irons are made in a variety of sizes and types, each suited to a particular need. Some are fitted with an automatic thermostat for controlling the iron temperature, to insure adequate soldering heat but prevent overheating. Other irons do not have this feature and must be regulated manually or by means of a rheostat in the iron circuit. A large size electric lamp bulb can sometimes be used as a fixed resistance for this purpose, where a number of duplicate pieces are to be soldered as shown in Fig. 5. Usually the size and type of iron tip is governed by the particular style of iron, but at least one make of iron can be had with nine assorted sizes and types of tips. Five of these are regular styles of tips; a sixth is curved to reach into difficult locations; the seventh consists of a small solder melting pot; the eighth is a tip designed for exploding expanding rivets; and the ninth is a socket for heating a small cordless soldering tool for use on very delicate work.

Electric soldering irons should be given care in order to prolong their useful life. While soldering, frequently flow fresh flux and solder on the working surfaces of the tip to maintain the tinning in good condition. Whenever the tinning becomes dull in spots scrape the spots down to clear copper and re-tin them. Armor clad tips should be scraped only lightly for retinning and then only if necessary. Usually dull spots can be freshened on such tips merely by applying flux and solder to them when they appear.

Never use a wrench, vise or pliers on the heating head of an iron unless it is specially designed for this. See that the removable tip is kept free of scale by occasionally removing it from the iron and cleaning the threads or shank and any seating surfaces. Keep the tip tight at all other times. This will help prevent the entrance of corrosive flux fumes into the interior of the heating head and also insure good heat conduction. Usually tips should be clamped carefully in a padded vise when installing or removing them from an iron, the heating head being rotated for this purpose. See Fig. 6. Sometimes a clamp-type tip may stick and require light driving to remove it. If a threaded tip sticks, hold the heating head in one hand, close to the tip, and strike the tip moderately with a hammer handle at various points around its circumference. In some instances oil may be required to loosen the tip.

To prevent corrosion of the iron parts, never let flux get on the untinned part of the tip, the tip seat or the heating head shell. Wipe the iron after use with a clean cloth moistened with heavy lubricating oil. This will help remove and resist both flux and oxide.

When an iron is being used intermittently or on light work it should be disconnected whenever its temperature rises above that needed for soldering. An iron not being used will quickly overheat and burn the tinning off the tip. If not disconnected it will eventually burn out the heating element.

An iron should not be suspended by the cord as this will throw a strain on the wire connections and damage the wires. If an iron fails to heat, check the cord plug and connections at the iron. If the trouble is not found there, disconnect the cord from the iron and connect it to a lamp socket. If the lamp lights and does not blink when the cord is moved, it indicates that the defect is present in the iron, and is probably a burned out element. If, however, the test lamp fails to light, it shows the trouble to be in the cord. Cautious bending of the cord along its length may reveal the location of the defect, signified by blinking of the lamp. Unless the cord can be safely repaired, a new one should be obtained.

World's Largest Boom Conveyor

Contributed by General Electric Co.

ONE OF THE fastest self-unloading systems yet devised, including the world's largest shipboard boom conveyor, has been installed recently on the Great Lakes vessel SS *Crispin Oglebay*.

The new all-electric conveying system is powered by approximately 750 hp in General Electric induction motors. Normal unloading speed of 1800 long tons per hour for ships of this type has been increased on the *Oglebay* to 2200.

The high unloading rate was obtained by widening the hold conveyor belts from the 42 in. commonly used to 48 in., and the boom belt from the usual 48 to 60 in. Its 96-in. bucket elevator speed is 100 fpm. The extra width not only allows for greater unloading speed but also permits the belts to be run at lower speeds to reduce wear and tear.

The conveyor boom is of all welded, alloy steel construction, which reduces its weight by about 10 per cent. Its 240-ft length, longest ever employed on a self-unloader, makes it almost half as long as the ship. Several innovations have been added to give it easier swinging ability. An "A"—frame for hoisting and supporting the boom rises 52 ft above it near the bow. The A—frame goes all the way to the bottom of the ship and is fastened rigidly to the hull and framing on the sides and bottom.

An oblique view from the inboard end, showing the world's largest boom conveyor driven by a 300 kw induction motor

Reliance Builds a New Plant

THE RELIANCE Electric & Engineering Co., Cleveland, Ohio, is a leading manufacturer of electric motors, generators, motor-generators, gear motors, and specially designed power equipment which is used in what are commonly termed the heavy industries, such as automotive, steel, paper, coal, textile, glass and machine tools.

The company was founded in 1905 by Peter M. Hitchcock, who was much interested in the active electrical experimentation of that day. Attention of company engineers was directed toward the design of improved electric motors, and particularly toward the development of a direct current motor capable of a wide range of operating speeds. Today the company makes alternating as well as direct current electrical equipment.

Following Peter M. Hitchcock's death in 1906, the firm was incorporated as the Lincoln Motor Works Co. and in August, 1907, Clarence L. Collens became president. Two years later the company took the name by which it has been known since—The Reliance Electric & Engineering Co. President of Reliance is now J. W. Corey.

Operations were at first carried on in downtown Cleveland, but in 1910 a factory was built on six acres of land on Cleveland's east side. The present main plant occupies the same site, but is about 12 times as large as the original building. The company also operates a second plant a block away on East 152nd Street and last summer completed the construction of a third plant in Ashtabula, Ohio, which now employs about 500 workers. First motors were shipped from this new plant July 28, 1947. This series of articles is concerned with this latest plant to be built and occupied by Reliance Electric.

New Ideas in Plant Facilities, Construction and Lighting

● **Innovations in construction, lighting, conveyorized and mechanized equipment, traffic flow control highlight new features at Ashtabula plant . . . Latest thinking on employee training, employee facilities, lighting and storage introduced at new plant**

COMPLETED and put into operation in July 1947, the new plant was built and equipped for the manufacture of power units for packaged adjustable speed drives, related electrical equipment.

Of simple functional design giving it a trim, clean-cut appearance, this new facility, 480 ft long and 250 ft wide, supplements the other Reliance plants in Cleveland.

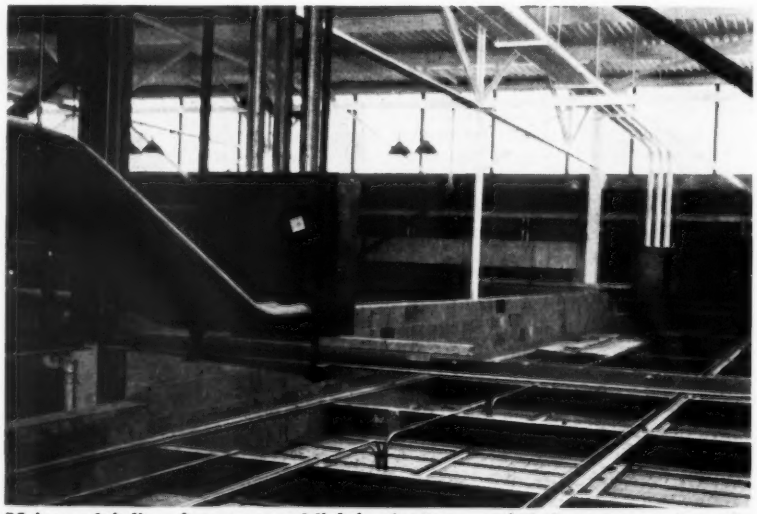
Employing 500 workers and providing a manufacturing area of 120,000 sq ft this building is distinguished by the effective integration of a compact equipment layout, continuous production flow system, mechanized materials handling techniques, overhead-mounted utility service facilities, an improved type of ventilation, and a comfortable working environment for both office employees and plant personnel.

The plant is served by a spur of the New York Central Railroad entering the south end of the building, where sheet steel, bar steel, copper wire and other heavy fabricating materials are delivered into the plant by carload. Quantity shipments of finished motors can be moved out over the same track to the company's customers. Switching facilities of both the Pennsylvania and Nickel Plate railroads also make other rail routings available for large-scale shipments.

Running through the center of the plant is a monitor that not only provided room for crane travel, but also afforded an opportunity for installation of fixed sash to supplement lighting facilities serving this particular area. Artificial light (mercury vapor, incandescent and fluorescent) is utilized to maintain a controlled condition of illumination at high, uniform intensity throughout the building for both day and night shifts.

As a result of these provisions, a functional production sequence highlights operations here. From receipt of raw material, through its fabrication and processing, to packaging and shipment of the finished product, there is little back-tracking or retracing in materials movement. Conveyorized and mechanized equipment, neatly integrated with this straight-line flow, saves manhours and conserves manpower in handling raw materials, semi-fabricated assemblies, and finished products.

To control traffic flow in and out of the plant between shifts and to prevent production interruptions from this source, certain personnel facilities (employment office, conference room, cafeteria, kitchen, dispensary, locker rooms and lavatories) are clustered close to the



Main conduit lines for power and lighting load are carried above trusses throughout the plant. This makes for easier maintenance of all equipment

building entrance on the north side.

The men's and women's locker rooms are equipped with 545 full-length, ventilated lockers, providing each employee with an individual locker. Resting on concrete islands 4 in. above the floor surface to facilitate sanitation, lockers are equipped with sloping tops. This feature discourages the tendency of workers to pile personal belongings or other articles on these surfaces and to encourage good plant housekeeping. A shower stall and dressing booth are provided in each washroom. Supplementing these facilities, centrally located in the plant, are balcony lavatories for both men and women.

Storage sections for steel, arranged to provide a capacity of 6000 lb per sq ft, permit high stacking of sheets below overhead cranes to conserve floor space. All large doors of the plant are electrically-operated; vertical lift doors are equipped with push-button and pull-rope controls in all openings subject to intra-plant traffic.

Materials handling operations are performed with a variety of equipment. On production lines gravity-feed roller type and overhead-trolley type conveyors are used. Individual machine tools and work stations are served by their own jib cranes; no heavy lifting by workers is required on any production job. A fleet of gasoline and electric-powered lift trucks facilitates handling of raw materials, fabricated parts and finished products. Two cranes of 3-ton and 5-ton capacity respectively in the center aisle serve the bar stock and sheet metal storage areas.

Ample space is provided for receiving and dispatching shipments via railroad or highway. Rail and truck areas are depressed, permitting all material to be received at floor level and loaded or unloaded from freight cars or trucks directly onto lift trucks and palletized equipment. These areas also have crane facilities.

Developed by the architectural engineers, truck dock lifts installed in both receiving and shipping departments provide fast, easy truck loading and unloading. Hydraulically-operated with push-button controls, these lifts (10 ft by 15 ft, and having a 30,000 lb axle load capacity) adjust the truck bed to dock floor level through an 18 in. range.

Plant equipment features provide semi-controlled conditions. Facilities for handling essential utility plant services—power, light, heat, gas, water, steam, air—are conveniently arranged to simplify equipment inspection and check-up and to assure maximum flexibility and economy of maintenance.

Electric power at 4600 v, 3 phase, is brought overhead to within 30 ft of the building, then underground to an outdoor transformer substation where it is stepped down to 460 v, and carried into the building to a secondary switch gear station on a mezzanine floor. The main breaker feeds six "draw-out" circuit breakers, one for each of the plug-in type buss ducts which run the length of the building.

Men's washroom in new Ashtabula plant features use of ceramic glazed tile on walls and red-colored asphalt tile flooring to promote ease of sanitary maintenance

All power requirements are served from these buss ducts. The lighting load is taken off through dry-type transformers, ranging from 15 kva to 37½ kva, depending on service requirements. Other loads are distributed over the buss lines to avoid creating voltage drops that would impair lighting efficiency.

In addition to lighting and motor loads there are other large electrical loads, namely: (1) electrically-heated ovens for baking armatures, coils and stators; (2) an induction furnace for melting aluminum in the rotor casting room; (3) ranges in cafeteria kitchen for cooking, and (4) test bench facilities for producing at various points all d-c and a-c voltages as required for production test work.

A considerable proportion of the equipment used in the machine shop, punch press departments and winding rooms requires the flexibility of variable speed for optimum efficiency of operation. This requirement, however, has not necessitated the introduction of separate d-c distribution throughout the plant. By capitalizing on the use of its own development, the adjustable speed drive, the company obtains, through on-the-spot conversion, the full flexibility of d-c current from the a-c power circuits serving the plant.

Exterior walls are 4 in. brick, backed up with light weight, precast cement block units, which are exposed on the inside of the building and which have an acoustic value. All exterior sheet metal is of copper. Outside walls also are reinforced to prevent cracks due to expansion and contraction caused by temperature variations. One transverse expansion joint across the building allows for dimensional changes resulting from temperature.

General interior partitioning is of cement block. Ceramic glazed tile wall facing is used in the cafeteria, kitchen, locker rooms and lavatories. The partition separating the men's and women's locker rooms is a sound proof, portable unit, which may be easily relocated should the ratio of male to female employees change.

Plant flooring generally consists of a 5 in. concrete base with a 2 in. creosoted wood-block wearing course. Floors in the boiler room and certain other areas have an integral topping of cement finish, while cafeteria, kitchen, locker and lavatory floors are red-colored cement. Office floors are finished with asphalt tile.

The entire interior of the plant is attractively painted, with the shop area in white above sash sill and pale green sidewalls with a dado several shades darker.

Current industrial management thinking on new plant planning holds that between 75 and 90 per cent of building area should be developed for parking. In line with this observation, Reliance provides for use by its Ashtabula employees a parking lot of 94,000 sq ft. Surfacing of the area, presently restricted to partial application of coarse and fine slag, ultimately calls for paving with black top drives and macadam parking spaces. Installation of flood-lighting also is planned. Service roads, storage areas and walks outside the plant are all of concrete.

Transferring Plant Operations Without Loss of Production Time

● **Special training plan for new employees plus coordinated and increased production schedules at Cleveland dovetailed into new plant operations . . . Plant engineering and process engineering departments worked together to bring about successful changeover**

HOW TO TRANSFER operations and the specialized equipment associated with them from an old to a new plant, manned by new employes, without incurring a serious loss of production in the process was one of the most important considerations which had to be faced.

Handling machinery as well as raw material stocks figured in the problem because production of these motors in the company's Cleveland plant was to be replaced there with operations of a wholly different character. Getting manufacturing operations in Ashtabula off to a fast start was further complicated by the fact that the new plant was 50 miles from Cleveland.

The plan of action which was finally formulated and carried through to completion in 1947 proved so successful that when the Ashtabula plant was opened last July, the twin jobs of keeping output at a high level in Cleveland while getting production under way in Ashtabula were accomplished without a serious hitch.

An unexpected "assist" in working out a satisfactory transition from Cleveland to Ashtabula was an order which was secured for several hundred motors of a special design, which proved particularly adaptable to the production facilities and personnel of one of Reliance's Cleveland plants. The contract called for deliveries to start two months before the move to Ashtabula and extend several months beyond this date.

Productive capacity of fabricating and machining facilities was increased over and above the requirement imposed by this extra load by the addition of a third shift. However, supervision requirements of this shift were kept to a minimum through the use of skilled operators as group leaders for training and operating purposes.

Job openings created by this added shift and those occurring through normal turnover were filled starting in October 1946, by hiring qualified applicants from Ashtabula who were sufficiently interested in working in the new plant there to come into the company's Cleveland plants for their initial on-the-job training. These applicants were of a uniformly high caliber, men and women who had been favorably impressed with the company's efforts during the preceding months to acquaint the Ashtabula public with its reputation of being good company for which to work.

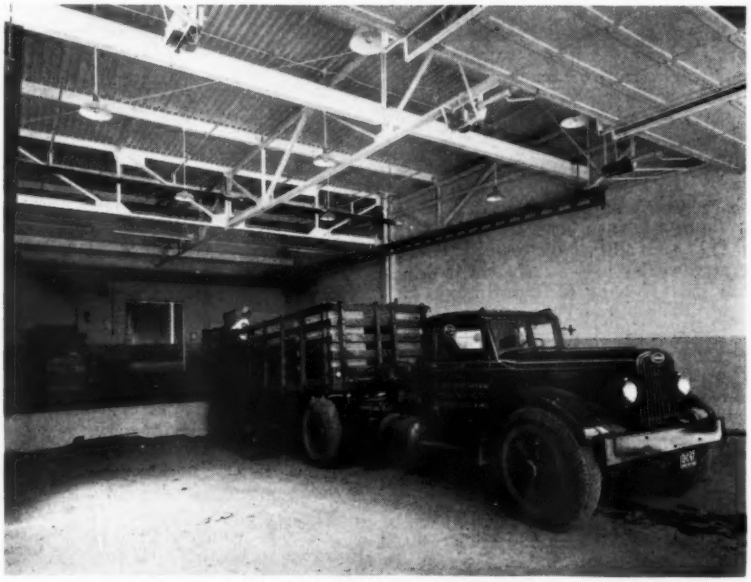
Production at Cleveland was then planned to increase gradually the inventory of standard stock motor parts, building this up to a point that would provide the extra supply it was estimated would be required to cover the training period following the move to Ashtabula. This start of third shift operations in October 1946, of course, wasn't as simple as it sounds. It presented the company's Purchasing Department, for example, with the tremendous task of procuring additional raw materials and supplies just at a time where scarcities were plaguing all of industry!

Meanwhile, the Process Engineering Department blueprinted details for "M-Day"—the movement of equipment, raw materials and finished motor components. This necessitated close co-ordination with the Production Department as the transfer of these items from Cleveland to the new plant had to be extended over a period of several weeks in advance of stopping operations in Cleveland on July 3. With the exception of certain bin-stocked small parts that were relatively inaccessible and removal of which would have seriously interfered with production, all material not in process was moved to Ashtabula by that date.

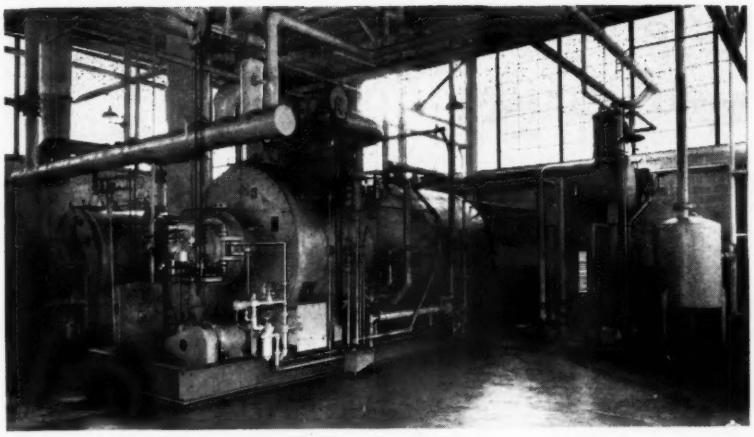
Starting July 4, maintenance workers disconnected punch presses, stator fabricating, rotor casting, coil winding, machine shop and other equipment in Cleveland and professional trucking crews mounted these various units on skids. Loading and moving by truck began on July 5, with all work carried on during two shifts. Wiring and installation of equipment were handled by separate crews in Ashtabula. The entire moving job was completed in the normal two-week vacation period when production was shut down at the Marine Division plant in Cleveland.

First equipment went into operation according to schedule on July 21. Four days later, the first Reliance motors to be assembled and tested in the new plant were crated and shipped from Ashtabula.

Most of August was spent in "tidying-up" the installation of miscellaneous equipment. The number of man-hours required to assemble all of the hundreds of small pieces of equipment into a unified operating layout, while it exceeded the original estimate, did not do so by too serious a margin.



Movement of machinery, raw materials and finished motor components was expedited by modern shipping and receiving facilities



This photograph shows the boiler room with two oil-fired package boilers which supply steam for the main plant heating system and for process work

Heating and Ventilating Show Advancements

● 18,000,000 cu ft of air per hr can be moved through ventilating system . . . Flexibility of control was first consideration . . . Plenum chambers, steam coils and fans all mounted on platforms make for ease in preventive maintenance

COMPACTNESS of layout, high operating efficiency with minimum interruption in service, ease of maintenance, and full availability of floor area for manufacturing purposes—these are among the features of the heating, ventilating system.

The ventilating system is specially designed to move as much as 18,000,000 cu ft of air per hour through the building, a sufficient volume to keep the plant interior under a slight positive pressure at all times, thereby effectively minimizing dirt infiltration. This system provides six complete changes of filtered air per hour during summer operation, and three complete changes per hour of tempered air for winter conditions.

The system consists of ten independently controlled mechanical supply duct systems with air discharged at each building column through outlets located at a height of 8 ft from the floor, to afford uniform air distribution throughout the building. Therefore, all areas are adequately supplied with air volumes at desirable velocities necessary to provide comfortable air conditions within the working areas.

Natural exhaust is effected through eight 66 in. diameter gravity-type roof ventilators equipped with pneumatically controlled louver dampers.

The entire system operates against a pressure of 1½ in. water gage which was found to be sufficient to counteract infiltration of dirt and moisture.

Flexibility of control to maintain service on an uninterrupted basis was the first consideration. The second was to keep the ductwork necessary to as simple an arrangement as possible.

Both conditions have been realized in the system of ten independently-controlled sections adopted. Interruption in the operation of one of them does not necessarily interfere with the functioning of the others to carry the heating and ventilating load of the plant. Use of several self-contained duct systems instead of a single large one has kept the size of the ductwork down, eliminating elaborate and possibly cumbersome feeder installations.

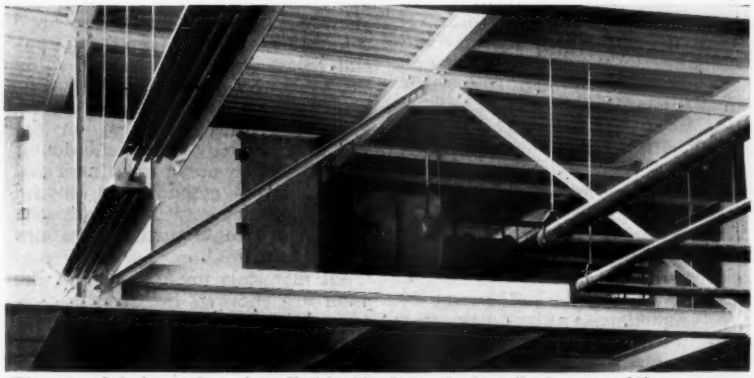
Exclusive of the downcomer ducts, the rest of the ductwork has been installed "upstairs"—between the bottom chord of the roof trusses and the roof proper—where it is out of the way, but readily accessible for inspection and maintenance.

The separate systems heat areas 80 ft by 125 ft through six discharge points. Downcomers closest to the wall distribute air to areas roughly 25 ft by 40 ft, while downcomers on interior building columns supply areas approximately 40 ft by 50 ft. Outlets on opposite walls of the plant are faced in opposite directions to maintain a continually circulating movement of air.

Each duct system has its own air inlet, equipped with weather-resistant louvers, and located in the sash just below the roofline. Air from each is fed into a plenum chamber supplied with filters of the washable viscous type which are easily removable for cleaning and recoating. As it is filtered the air enters a second plenum chamber where ample space has been provided for the placement of cooling coils should summer air conditioning subsequently be wanted.

From the second plenum chamber air can be drawn into either of two fans. One fan operates the year 'round; the other is used only during the summer months. For winter heating the air is carried over steam coils, each of 451,000 Btu capacity, converging into a single duct from which branch the downcomers. Dampers located throughout the duct network balance the flow of air at each downcomer.

Unusual compactness of layout and high efficiency of operation are achieved through the use of a new type of industrial fan mounted, complete with single-speed motors of a special type, inside the duct itself.



The use of Axivane fans, installed inside ducts, is described as providing compact layout and high efficiency. Platform mounting eases maintenance job

Coordinated Materials Handling Operations Speed Production

● Conveyors connecting various work stations total 2615 lineal feet . . . Three functionally parallel production lines utilize powered conveyors, hand trucks, fork trucks, monorail conveyors, gravity conveyors . . . dock lifts at loading and unloading areas speed movements in and out of plant . . . Service station for power trucks

AN INTERESTING indication of the manner in which modern management is becoming more and more materials-handling conscious, may be found in the new Reliance plant. Approximately 2615 lineal feet of conveyors connecting various work stations, a fleet of three electric and one gas powered elevating type fork trucks, seven electric powered and ten hand type pallet trucks, skids and pallets numbering 2800 units, inside and outside skid and pallet storage—all are effectively combined.

The manufacturing layout comprises three functionally parallel processing lines. Into each line materials are funnelled from an ample, centrally-situated storage area.

One line feeds the Fabricating Department, which converts sheet steel, plate and bar stock into stator, rotor and armature laminations and weldments. A second line serves the Machine Shop, where bar stock weldments and castings are machined into finished motor components. The third line carries wire, insulating materials and a certain percentage of machined parts through a winding room where they are processed into motor armatures, fields, rotors and stators.

Several shorter lines from supplementary operations feed into these three main manufacturing lines, which merge to form the motor assembly line. Handling facilities and techniques, by moving materials and parts in a steady stream from storage areas into all fabrication channels, keep production flowing smoothly and at a uniformly high rate.

All incoming materials enter the building at the south end, where totally-enclosed rail and truck docks are located. Bar stock and sheet steel can be handled in carload lots since the railroad dock, 130 ft by 20 ft, accommodates two rail cars at a time. Rails are depressed in a concrete pit, putting the deck of a gondola, flat or box car at the same level as the plant floor. The dock is served by a 260-ft craneway equipped with a 5-t crane. Large shipments of outgoing products may also be handled here.

Similarly, the area for receiving truck shipments has been designed for maximum materials handling flexibility. Likewise totally enclosed for all-weather operation, it is 80 ft long, 40 ft wide, and 18 ft high, readily accommodating at one time three of the longest tractor-trailer combinations in general highway transportation use today. Like the rail dock, this area is depressed, thereby enabling all materials to be unloaded or loaded directly at floor level onto lift trucks or pallets. A 54-ft crane with a three-ton crane provides adequate capacity for servicing this area.

Worthy of special note is an unusual feature in both receiving and shipping areas that further expedites unloading and loading of trucks. Two hydraulically-operated, push-button-controlled dock lifts, permit adjusting any truck bed through an 18-in. range to the level of the shipping and receiving dock floor.

Each lift is 10 ft by 15 ft and will handle axle loads up to 15,000 lb. Thanks to the quick, convenient access to floors of trucks and trailers resulting from the installation of these lifts, large unit loads can be readily palletized and handled with the plant transport equipment.

Each production line has its own storage area. Bar Stock and Sheet Metal Storage serves the Fabricating Department and Machine Shop, which also receives castings from an outdoor storage area 200 ft by 300 ft located along the east wall of the building. Storeroom A, toward the north end of the plant, is used for finished assembly and miscellaneous parts. In Storeroom B, adjacent to the Assembly Department, are stocked finished armatures and rotors for motors covered by special sales orders. Storeroom C in the southwest portion of the buildnig furnishes stators, frames, shafts and other processed parts for the Winding Room, where insulation is applied, coils wound, armatures and stators impregnated by a special varnish dipping-and-baking process, and other manufacturing operations performed.

All materials upon receipt at the plant are checked for quantity, inspected and identified, then transferred either to indoor storage or outdoor storage. Bar and sheet stock is moved into storage directly by crane, while other materials are loaded onto pallets or skid platforms for transportation by fork lift trucks to the proper stockroom.

A clear-cut delineation of responsibility is a feature of the materials handling performance at the Reliance plant in Ashtabula. The foreman of the Stores Department is responsible for movement of material from stock to point of production use. Each fabricating or processing department, in turn, takes care of moving material from one operation to another within its own particular area. Then, when processing of work by that department is completed, the Stores Department moves the parts to the next department which, again, supervises the movement of all material within its own area. Thus, inter-departmental transportation of materials is handled by the Stores Department, while intra-departmental movements are directed by each department itself.

Three different types of mobile

Use of jib cranes, electric operated hoists, monorail conveyors and other types of materials handling equipment simplify handling of raw materials and finished product

equipment are used for handling castings, shafts, frames, baffles, covers, laminations, wire, insulation materials and miscellaneous items on metal skids and wooden pallets: (1) electric and gas powered elevating fork trucks of 4000 lb, 11 ft-lift capacity; (2) electric pallet-type fork trucks of 4000 lb capacity; and (3) hand-hydraulic pallet-type fork trucks of 4000 lb capacity.

The two major storerooms—A and C—are equipped with steel racks on which 1705 loaded skids and pallets may be stored. These racks permit full use of "air rights" up to 15 ft clearance beneath the roof trusses, thereby assuring peak economy and optimum utilization of available floor space.

Materials movements within each processing department are accomplished through the use of the fork-type pallet trucks or by gravity roller-type conveyors where particular processes lend themselves to the application of the latter equipment. The longest such line, containing a total of 1066 ft of conveyor, serves the stator fabricating, machining, benching and inspection departments. Stators travel from one processing station to another, moving horizontally throughout this sequence.

Extensive use of gravity conveyors also is made in the plant's Winding Department. The installation contains a total of 817 ft of conveyor. The entire motor assembly, inspection, testing, painting and shipping areas are similarly conveyorized for a total distance of 730 ft.

An overhead monorail-type conveyor system forms an integral part of the d-c coil dipping-and-baking operation. One track section of this conveyor is raised and lowered by means of an electric hoist to dip coils suspended from racks into a tank of insulating varnish.

In the shipping area, motors packed in corrugated containers, wirebound crates and standard crates are carried by lift trucks to the warehouse area, where they are pallet-stored. This area, 56 ft by 46 ft, is equipped with special racks similar to those used in the raw materials and finished parts storerooms. These steel racks, including the necessary bracing pieces were partially prefabricated by an outside contractor and then assembled on the spot in the Ashtabula plant.

It is also highly interesting to note that throughout the entire plant, in all key production departments and adjacent areas, individual machine tools and work stations are served by their own jib cranes and electric motor-operated hoists. At no point throughout the manufacturing cycle is heavy lifting required of the workers.

With the exception of sheet steel and bar stock, all incoming and outgoing materials, parts and products are transported by lift trucks where operations are not conveyorized. As the plant is now working on a regular two-shift, and on bottleneck operations, on a three-shift basis, the demand on the transportation equipment is very heavy and exceptional maintenance must be provided if materials and parts are to be kept flowing into production at a high rate.

To meet this stringent requirement, a "service station" for maintaining these trucks has been provided. In this area, 35 ft by 15 ft, trucks are thoroughly inspected and checked and their batteries changed at the end of each eight-hour production shift. The area is equipped with battery chargers, storage racks and conveyors. All major mechanical repair and service work is done on Saturday mornings when the plant is not in operation.

Because this overall preventive maintenance program has proved so effective, out-of-service time of lift trucks is virtually nil. Little production time is lost or processing interruptions incurred due to truck break-downs or failure to move materials in high tempo.

Solving the In-Plant Feeding Problem

● Modern equipment and staggered eating schedules handle entire plant in 96 seat cafeteria . . . Food storage, preparation and serving equipment are all electric . . . Decorative scheme provides a restful atmosphere for workers

WITH IN-PLANT feeding subject to wide variation, both in scope of operation and performance throughout industry, the provision of such service for workers presents a far greater problem in some plants than it does in others. Size of the organization location of the plant, number of employees, accessibility of other eating facilities—these factors, among others, are involved in the formulation of any sound food service program for personnel.

The question of in-plant feeding facilities at the plant in Ashtabula received just as careful attention as that given to other functional requirements of the building. The result of this practical approach to the problem is a cafeteria which has been designed to do a specific type of in-plant feeding job at an economical cost.

While there are no restaurants in the immediate vicinity of the new plant, the business district and residential areas of Ashtabula are only a few minutes' drive for those employees desiring to eat their noon meal either at home or "downtown." Also, it was recognized that some workers would prefer to pack their own lunches.

In the light of this anticipated "competition" with a plant cafeteria, the problem boiled down to providing restaurant facilities with sufficient flexibility to supply a sandwich, a snack, or a complete dinner, but for considerably less than the 500 who would be employed in the plant. Such a cafeteria need not be large, Reliance planners reasoned, so long as it would enable a large number of people to be fed quickly.

The cafeteria provided fills the bill nicely. The dining room, 25 ft wide and 48 ft long, seats 96 at a time. Capacity of the cafeteria has been purposely limited to this figure, since it represents about as many from one shift as can be served within the 30 min per shift allotted for the meal. The serving room is 15 ft. wide by 21½ ft long, and the kitchen 21½ by 24 ft.

The entire feeding job is accomplished in one hour and 15 min. Staggered schedules, providing for feeding personnel from each department at different time intervals, avoids the over-crowded and congested conditions which would ensue were feeding of all employees as a single group attempted at one time.

What the individual worker likes best of all is the ample food selection provided. Whatever is desired —whether it be a complete meal, a sandwich or a salad—he can secure at a low price. Or, perhaps he brings his own lunch and merely wishes to supplement it with a beverage or dessert. These, too, are available to him.

Food storage, preparation and serving equipment, (range, refrigerator, meat chopper, coffee urns, steam tables) are all electric. Located in the northwest corner of the building to secure the benefits of cross-ventilation, the cafeteria installation also includes a storeroom.

A cheerful environment is provided through a decorative scheme that accentuates a "restful" color pattern. Walls are painted in pale green, with a dado several shades darker. Flooring is red-colored cement.

Plant workers have a "voice" in food service through a six-man advisory committee of their own choosing. This group meets periodically with Luther M. Dobbs, cafeteria operator, to air complaints.

Maintenance--A Fine Art Which Cuts Costs

● Maintenance innovations by plant engineering department . . . Spotlight painting of production machinery . . . Self-coiling extension cords on hand power tools . . . Elevating steel safety ladder for high, overhead maintenance . . . Weekly checkup supplements daily preventive maintenance program . . . Survey of V-belt and lubrication requirements for every machine are maintenance guides

A NUMBER OF time-saving, work-conserving maintenance aids that help keep shop safety standards high, minimize down-time of production equipment, and expedite plant housekeeping and sanitation are employed by The Reliance Electric & Engineering Co. at its new Ashtabula factory.

One of the most interesting "new wrinkles" in maintenance now going forward in this new plant is a comprehensive program of "spotlight" painting machine tools. Preliminary tests of this practice, which consists of applying a neutral gray to the main portion of the tool, but using a high gloss buff color enamel for working areas and moving parts, showed that the light reflected on work piece, dials, scales, pointers, etc., was appreciable. The resulting reduction of eye fatigue and visual tension of operators has tended to maintain more uniform production rates.

From a cost standpoint, the effect of such spotlight painting has been to promote economy in lighting without sacrificing efficiency. In many instances, similarly painting such equipment as boring mills, drill presses, lathes, and punch presses has either eliminated or substantially reduced the need for portable extension lights over the immediate work areas of each machine. To date, about 30 units have been painted in this fashion, and it is planned to paint 70 other machines, so that ultimately all the plant's heavy production equipment will have been treated in this fashion.

In addition to increasing visibility of work on the machine, this painting practice also has proved an aid to more effective plant housekeeping. Psychologically, the practice appears to increase the individual operator's sense of good housekeeping, making him more conscious of the importance of keeping his particular equipment in the condition best calculated to achieve maximum performance. It's proof of an old rule that most maintenance men remember very well: A clean plant starts with clean work places kept clean by the workers themselves.

Second aid to plant safety recently inaugurated is the use of self-coiling extension cords on portable tools. These eliminate the hazard created by cords left to trail across the machine or the floor as is so common with the ordinary type of extensions used. Chances of an operator getting tangled up in the cord, losing his footing, slipping or falling are virtually eliminated.

To date, only a handful of portable tools have been equipped with this self-coiling extension cord, but the enthusiastic reception accorded the innovation by the Reliance workers already provided with them has been so marked that the company plans to similarly equip all extension lights and motor-operated jib cranes, making a total of 85 units to be installed.

Maintenance of lighting equipment and overhead construction has been put on better basis by introduction of a third device—a portable elevating steel safety ladder.

Provided with a platform attached 10 ft above floor level, the ladder and platform can be elevated an additional 9 ft. The platform is equipped with a 4 ft safety rail to reach a total distance of 23 ft above the floor level, thereby enabling any maintenance worker of average height to reach any point in the building at a height of 26 ft overall.

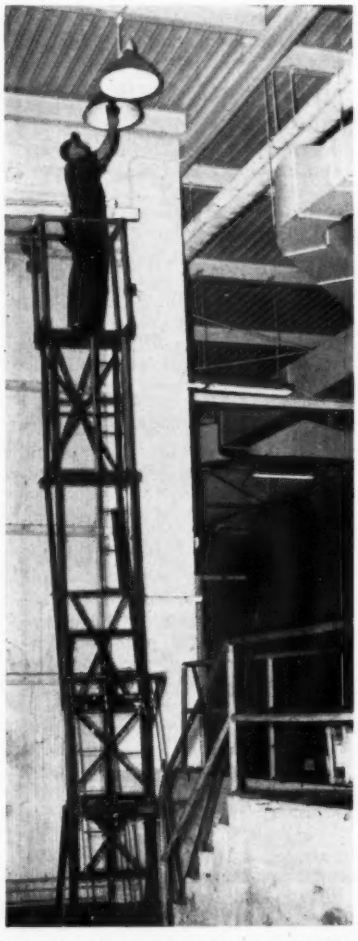
With this ladder, a maintenance man can in many cases change lamps or tubes or wash reflectors over machines without interrupting their operation or otherwise interfering with production while this essential maintenance work is performed. Foot-candle output over vital working areas thus can be retained at all times at the high levels required for the best work. Lighting intensities range from 35 foot-candles in general throughout the plant to as much as 100 foot-candles in inspection areas, with illumination for various stages of processing held at intermediate levels related to the requirements of the particular operations involved.

Other uses for the ladder include servicing yard and plant lighting equipment outside the building, and taking inventory of stock shelves and bins.

A fourth maintenance highlight is the "service station" provided for a fleet of battery-powered fork lift trucks and transporters used in handling both raw materials and finished products. This space, measuring 35 ft by 15 ft and located at the south end of the building, is equipped with battery chargers, storage racks and conveyors.

The maintenance schedule is geared to permit 'round-the-clock utilization of these materials handling units as demanded by the plant's double and triple-shift operations. At the end of each work shift, trucks are brought into this service station for battery changes, quick inspection and minor adjustments. Here, also, the gasoline-propelled unit, which is used outside the plant for movement of castings and certain other parts is given mechanical inspection and lubrication service. Refueling of this unit is done at an outdoor pump.

Supplementing this daily maintenance routine is the weekly checkup and service, which is performed every Saturday morning. At this time, tires are inspected for wear and abrasions, and all major mechanical adjustments and repairs carried over during the week are made. Each unit is pressure-lubricated every three weeks.



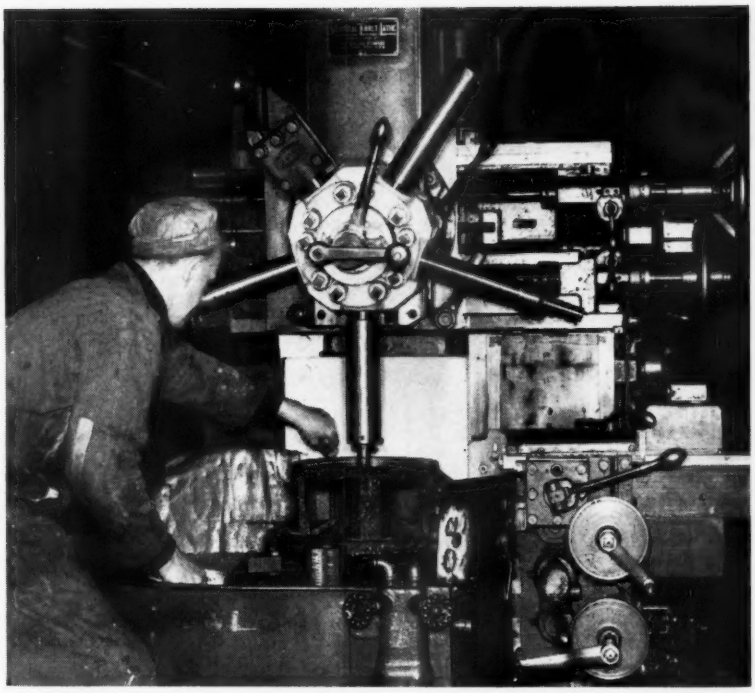
Portable elevated steel safety ladder facilitates maintenance of lighting and other overhead equipment

As a result of the effectiveness with which this overall preventive maintenance program is carried out, production time lost or processing interruptions incurred due to materials handling equipment being taken out of operation for maintenance and servicing are kept to a minimum.

For moving machine tools into the plant and for use in connection with outdoor work, a pneumatic-tired farm tractor of 23 hp has proved a tremendous aid. Its high maneuverability, and the flexibility of operation resulting from the availability of a number of special attachments have made it an ideal vehicle for all-purpose use around the plant.

In electric motor maintenance, the availability of supply stocks of repair parts is a prime requisite to reducing equipment down-time and putting units quickly back into production-line service. This is a tenet of good maintenance long advocated by Reliance. Gears, levers, bearings, clutches, brakes are stocked in quantities which past experience has determined are necessary to make exacting on-the-spot repairs with a minimum of lost production time.

V-belt and lubrication requirements of all machines in the plant also have been completely surveyed by outside engineers working in collaboration with the plant maintenance staff. These surveys are used as guides in performing required maintenance and servicing of equipment. Full lines of belts are stocked by the maintenance department to meet belt replacement requirements of all machines with minimum loss of production time. A complete stock of lubricants is maintained at the plant for the same reason.



Spotlight painting of machine tools is an aid to better lighting and produces less eye fatigue. By allowing dirt to be seen more readily the company has found that this type of painting results in better individual housekeeping by machinists

Maintenance of ventilating equipment also features the use of various practices that minimize down-time, keep the system functioning at peak efficiency, and economize on service.

The forced-air type ventilating system used at the Ashtabula plant incorporates 340 filters, the elements of which are of the washable, viscous type. These are removed, in relays of 30 at one time, and immediately replaced by cleaned and reconditioned units.

Dirty filter elements are cleaned by the immersion method. The dip tank, 30 in by 30 in, is constructed of welded steel, and is steam-heated to maintain the cleaning solution at a temperature of from 130 to 140 F. The solution used is non-inflammable and non-toxic.

Filters are dipped in this solution for one minute, during which they are agitated by swishing them back and forth through the solution to increase cleaning efficiency. Filters then go to the rinse tank where they are rinsed in clean hot water, after which they are recoated with a special oil. Allowed to drain for 24 hr, they are then ready to be reinstalled.

Safety dictates perpetual inspection of ladders, rope and chain slings and cranes for defects and wear. Similarly, a mobile fire fighting unit is kept under constant observation. Also, every nook and cranny of the factory is inspected with an "eagle-eye" every week to ferret and stamp out any conditions that might create possible fire hazards.

A somewhat novel maintenance angle at the Ashtabula plant that holds unusual interest from the supervisory standpoint is the accessibility of the maintenance foreman's equipment catalog library to all department workers.

This general view of the plant shows how one area of the plant has benefited from the maintenance and housekeeping practices at Reliance. Note uncluttered, clean floors, orderly arrangemnt of stored stock and general atmosphere of tidiness

Suppressing Noise and Shock in Direct Mixing Water Heaters

Undesirable noise and vibration in water heaters using direct mixing of steam and water can be avoided by properly designed mixing chambers . . . Construction details of improved mixing chamber . . . Remedies for noise and shock . . . Results of experimental work leading to the improved design . . . Satisfactory operation to temperatures of 195 F

By **WILLIAM R. OLSEN***

APPLICATION of submerged direct-contact steam jets for heating water is somewhat limited because of the violent surging and pounding which may accompany the injection of steam into water. This disturbance becomes particularly objectionable when the water is at temperatures above 160 F. There are a number of relatively inexpensive steam-water mixing nozzles available for commercial use today. One of those, illustrated in Fig. 1, was used for repeated tests conducted by the author. Relatively noiseless and smooth operation could be had at water temperatures below approximately 165 F. However, at water temperatures above 165 F operation was accompanied by extensive noise and vibration.

Continued operation at temperature levels above those at which pounding and noise first appear, resulting in a rapid increase in intensity. In a vat pasteurizer, equipped with a direct-contact type steam heater the vibration became so severe at times as to force the pasteurizer about on the floor. A steam injection nozzle supplied with steam at a pressure of approximately 650 psig from ½ in. line was used. The vat pastuerizer with 50 gal of water in the vat and 30 gal in the water jacket weighed approximately 800 lb. The fact that the pasteurizer was held comparatively steady by the steam pipe and drain pipe connections further emphasizes the force of the shock fronts created by even a small steam nozzle. It seemed quite apparent in the tests conducted that permanent damage to the equipment might result if the steam heater were permitted to operate beyond a water temperature of approximately 165 F.

Because of the wide variety of uses for this type heater, a method of increasing the operating range with relatively minor changes in design should prove to be extremely useful.

Causes of Noise and Shock: The operation of this type water heater is relatively simple. Steam passes from a high pressure area through a nozzle, usually convergent, into the mixing chamber. Upon impact with low-temperature water the steam condenses, giving up its latent heat of vaporization to the water. The high velocity of the steam as it leaves the nozzle induces a suction on the liquid on either side of the nozzle and imparts a velocity to the liquid in the same direction as the flow of steam, thereby creating circulation of the liquid being heated.

Though the actual cause of noise and shock in a steam-operated direct-contact water heater is still open to question, the elimination of low pressure areas and the creation of turbulence within the mixing chamber have been observed to appreciably improve the performance of the heater.

Low Pressure Areas: At low water temperatures the steam emerging from the nozzle into the mixing chamber is condensed rapidly, thereby permitting a full channel of water to be moved through the chamber. At higher water temperatures the steam is condensed less rapidly, permitting the steam bubbles to move farther out into the mixing chamber before collapsing. As a result of the collapse of the steam bubble there are momentary low pressure regions created around the perimeter of the mixing chamber. The water in the mixing chamber, at atmospheric pressure plus the pressure of the head of water above it, rushes into the low pressures regions with an impact. The impact effects thus created are transmitted undiminished in all directions, resulting in the undesirable pounding and surging.

Turbulence: In the experimental tests made with this type water heater, large steam bubbles were seen to emerge from the mixing chamber as operation of the heater became violent. This led to the conclusion that prevention of large bubble formation in the mixing chamber would further improve

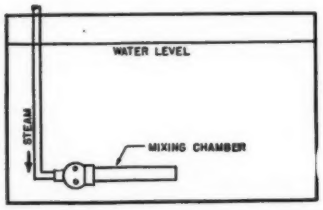


Fig. 2. A steam-operated, direct-contact type water heater installed. Details of the mixing chamber are shown by Fig. 3

*Assistant Professor of Mechanical Engineering, North Dakota Agricultural College, Fargo, North Dakota. The author was formerly Research Associate at Iowa State College.

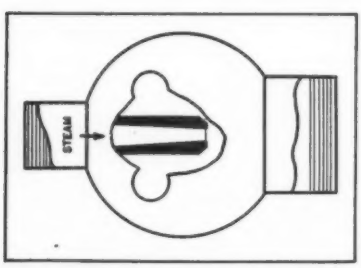


Fig. 1. The type of mixing nozzle used by the author in his experiments

Table I. Data from the experimental tests showing the operating conditions, time required for heating and the maximum noiseless operating temperatures. By changing the design of the mixing chamber the author was able to increase the maximum temperature for satisfactory operation from 160 to 195 deg F

Mix Chamber Design	Water Heated gal	Steam Pres. psig.	Steam Qual. %	Water Temp. Init. F	Water Temp. Final F	Time to Heat min	Maximum Noiseless Operation F.
Fig. 3A	75	55	97.5	74	169	24	160
Fig. 3A	75	102	98.0	70	170	11	165
Fig. 3B	75	65	97.0	65	196	26	195
Fig. 3B	75	80	98.0	115	196	14	195

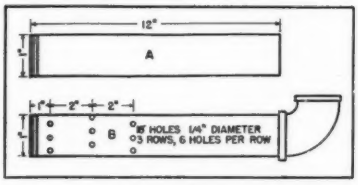


Fig. 3. A (above) Mixing chamber design commonly used. B (below) The altered mixing chamber design as recommended by the author

operating characteristics of the heater. In some instances steam bubbles of approximately ¾ in. dia were observed emerging from the mixing chamber, giving an effective area through which heat transfer might occur of 1.77 sq in., assuming the bubble to be of spherical shape. If a ¾ in. dia steam bubble is broken up to form eight smaller bubbles, the effective area for heat transfer is increased approximately 100 per cent. The increased surface available through which heat might be transferred from the steam to the water permits more rapid condensation of the steam with a resulting decrease in noise and vibration.

As a result of the experimental work performed with direct-contact water heaters, the effect of certain variables on the operating characteristics of the heater can be summarized:

Effect of Varying Pressure: In varying the steam pressure from 40 psig to 100 psig the only noticeable effect was a slight decrease in time required to heat a given quantity of water to a prescribed temperature. It is of course necessary that the head of water above the steam injector be sufficient to dampen the more rapid circulation created at higher pressures.

Effect of Preventing Low Pressure Areas Within the Mixing Chamber: By drilling a series of small holes at specified intervals in the mixing chamber so as to permit additional water flow into the low pressure areas, the noiseless operating range of the heater was increased from 165 to 186 F.

Effect of Creating Additional Turbulence Within the Mixing Chamber: In addition to drilling holes at specific points in the mixing chamber additional turbulence was created within the confined area of the chamber. By the simple expedient of attaching an ell or tee to the end of the mixing chamber, causing a reversal of flow with resultant increase in turbulence, the noiseless operating range of the heater was advanced to 195 F. It is interesting to note that operation of the heater with the above mixing chamber design was completely silent at 195 F. but rapidly became noisy and violent as operation continued, thereby limiting safe operation to a maximum value of 195 F.

Remedies For Noise and Shock: Illustrated in Fig. 3A is a commercial mixing chamber design used on ½ and ¾ in. steam heaters, the size referring to the steam inlet. In Figure 3B is shown the altered mixing chamber design recommended by the author to increase the noiseless operating range of the heater. Making the minor changes shown will increase the operating range of the heater by approximately 30 F. and insure quieter operation during the heating period. It is important to note that comparable tests made on ¾ and ½ in. size heaters revealed the same result. The altered mixing chamber design appreciably increased the noiseless operating range of the heaters. The table is a summary of the experimental results gained in the investigation of steam-operated direct-contact type water heaters.

Insulation of Heat Exchangers

Contributed by J. C. Moore

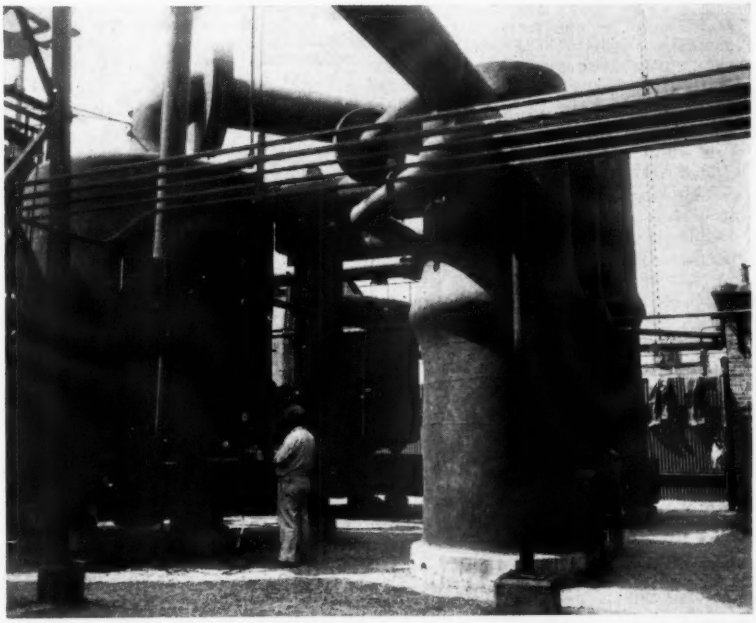
KOPPERS Co., Chemical Division, Kearney, N. J., when it recently constructed an outdoor sulphuric acid plant was faced with the problems of: 1 insulating two converters to prevent heat loss and increase the efficiency of the units, 2 insulating three heat exchangers both for greater efficiency and to prevent heat from radiating into nearby work areas, and 3 adequately protecting the insulation from the elements in the out of doors plant.

The two converters, used to convert SO_2 and SO_3, are 16 ft high by 9 ft. 11 in. in diameter and operate at a temperature of about 500 F. In order to minimize heat losses and to prevent the catalyst from cooling when the converters shut down, 5-in.-thick mineral wool blankets cover both converters.

To install the blankets on the large surfaces of the converters, galvanized wires were first welded perpendicular to the surfaces on eight-inch centers. Blankets, comprising mineral wool sandwiched between galvanized woven wire on one side and expanded metal lath on the other, were then impaled on the wires with the expanded-lath side exposed; the wires were then bent upward and pressed into the blanket to hold them in place. The edges of the expanded-lath blanket-covering were laced together with 16 gauge galvanized wires. A ¼-in. coating of mineral wool cement was then troweled into the lath to seal the insulating covering completely. Over this cement coating a layer of chicken wire was secured as a base for a final asphalt coating, which provides weather protection.

The large disc-like protrusions noticeable in several sections of the insulating piping are expansion joints provided to prevent leaks from developing when contraction and expansion result from shutting down and starting up the unit.

In making converter and heat-exchanger repairs, sections of blanketing are simply cut away and then replaced when the repairs have been completed. The acid plant has been in operation since last September and to date no insulation difficulties have been experienced.



These are the insulated heat exchangers at Kopper's Co's. Kearney plant

Making Air Duct Calculations Easy

By THOMAS M. JACKSON

The author of this article and originator of the Air Duct Calculator has, during the past 15 yr, designed air distribution systems for the Federal Reserve Bank Bldg., New York City; St. Louis Ordnance plant; University of Minnesota hospital and many other buildings, all of them calculated by use of existing charts and graphs. Now he has developed this simple, easily-read calculator which can reduce design time by 75 per cent and eliminate the use of charts in design work

DURING THE past 10 yr the writer has calculated innumerable air ducts. After wearing out several charts in these operations the idea occurred that, the essential data being simple mathematics, it could be laid out on a scale or combination of scales which would be easier to use than a chart.

With that thought in mind, a simple model scale was made for volume (cfm) and a graduated slide scale for round duct diameters. An arrow located the velocity since a given round duct carrying a certain cfm has a constant velocity. The first calculator was fairly simple to design on the basis of velocity.

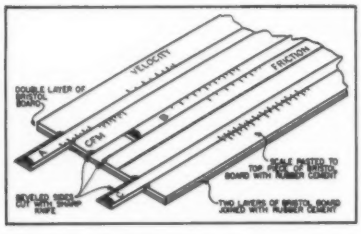

VELOCITY
FRICTION
CFM
DOUBLE LAYER OF BRISTOL BOARD
BEVELED EDGE CUT WITH SHARP KNIFE
SCALE PASTED TO TOP SHEET OF BRISTOL BOARD WITH RUBBER CEMENT
TWO LAYERS OF BRISTOL BOARD JOINED WITH RUBBER CEMENT

Fig. 1. This shows how the calculator scales may be cut from this article, pasted on a piece of Bristol or other heavy cardboard and used. The slides with bevel edges may be cut readily with a sharp knife and straight edge

The next step was a set of scales to convert round ducts to equivalent rectangular ducts. This was not easy because there is a material difference in the carrying capacity of a square duct and a flat duct with a depth to width ratio of 1 to 10. It was necessary to calculate each size by the formula:

$$d = 1.265 \sqrt[5]{\frac{(ab)^3}{(a+b)}}$$

where d=diameter of equivalent round duct; a=width of rectangular duct and; b=depth of rectangular duct.

From these calculations a pair of scales was laid out so that the scale for equivalent round ducts was easily located from the two rectangular scales. Occasionally it is necessary to design a system by the Friction Loss Method, so another scale was added and matched with the cfm scale.

The two scales for estimating the weight per lineal foot of round ducts is simple for we are usually interested only in 16, 18, 20, 22, 24 and 26 gauge ductwork. By using two log scales on a slide, one for duct size and one for weights with a fixed arrow for selecting the size of desired round duct, the various gauge marks could be located.

Depth and width of a rectangular duct are known, so it is logical to take the sum of these as the index on the top scale and move the bottom scale to the proper weight reading at the various gauge marks for rectangular ducts. The back of the calculator has a table of accepted duct velocities for various units, also a table of gauge metal for ducts of various diameters or widths.

A typical example is worked out in the table given below

REQUIRED

1. The size of a round duct
2. Velocity
3. Size of equivalent rectangular duct
4. Gauge of metal
5. Weight of round duct per lineal foot
6. Weight of rectangular duct per lin. ft.
7. 300 cfm of air at 0.3 friction.

SOLUTION

1. On Scale B set the arrow at 0.3 friction, read 10 in. dia round duct opposite the required 800 cfm.
2. On Scale A set 10 in. opposite 800 cfm and read 1450 ft velocity.
3. Set arrow on Scale C at 10 in. dia round duct, read equivalent rectangular ducts, 9 in. x 9 in. or 7 in. x 12 in. or 6 in. x 14 in. or 5 in. x 18 in. at a single setting.
4. Gauge of metal for either round or rectangular duct is selected from the Gauge Metal Chart which is printed on the reverse side of the Calculator. If a round duct is under consideration and you want to know the weight of the duct per lineal foot for any given gauge metal all that is necessary is to follow the simple directions noted on Scales D and D'.

VELOCITY METHOD

1. If the duct is to be sized by the Velocity Method, at say, 2600 ft velocity, set arrow on A scale at 2600, read 7½ in. dia round duct opposite cfm. On B scale set 7½ dia round duct opposite 800 cfm, read 1.25 friction loss at arrow.
2. The remaining operations of selecting the rectangular equivalents, weights, etc. are as described in the first solution, using the new duct sizes.

A table shows the friction loss in 1½ radius elbows. That is, 1½ radius of either width or diameter of the duct required for given cfm at a given velocity. In the design of a duct system, calculation of friction loss of elbows is a major problem. Since it is common practice to use 1½ radius elbows and since such elbows are approximately 1/5 of the velocity head for a given velocity and cfm, the Friction Loss Table for elbows was worked out on that basis.

There are certain restrictions on this calculator. It is not intended to give an equivalent rectangular duct beyond a 1 to 7 ratio of depth to width. It should not be used where accuracy greater than 5 per cent is needed.

The writer has used the calculator on several large public building designs and had the work checked with the existing charts for duct calculations. No errors were found. One outstanding feature is that the slide can be set at a fixed Friction Loss or Velocity and the Round Duct sizes for various quantity of air can be read at one setting. This is a great time and labor saver as the designer can size an entire system, without moving the slides, by simply reading the round duct sizes opposite the required cfm.

Another feature is the ease with which one can find rectangular duct sizes equivalent to given round duct sizes. There are usually some limitations and one soon becomes accustomed to using the scale marked "Depth" as a starting point in selection of the rectangular duct.

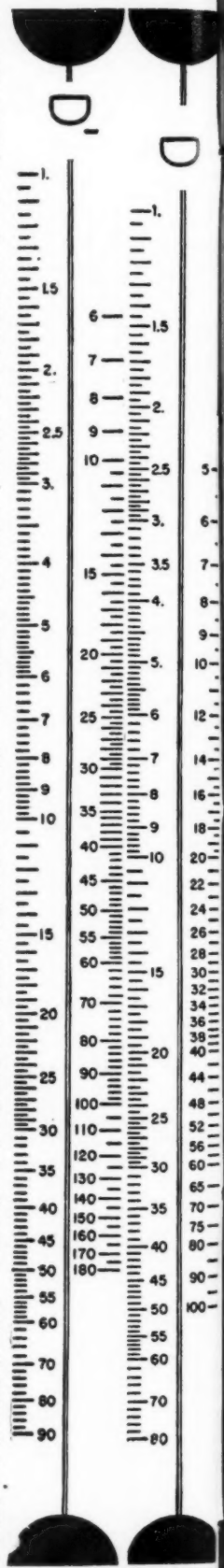

D'
D
AIR DUCT CALCULATOR
VELOCITY
set arrow on VELOCITY and read ROUND DUCT SIZE opposite the required C.F.M., on scale A.
Set C.F.M. and DUCT SIZE on scale B, read FRICTION.

Fig. 2. These are the ft D and D' scales in Fig.

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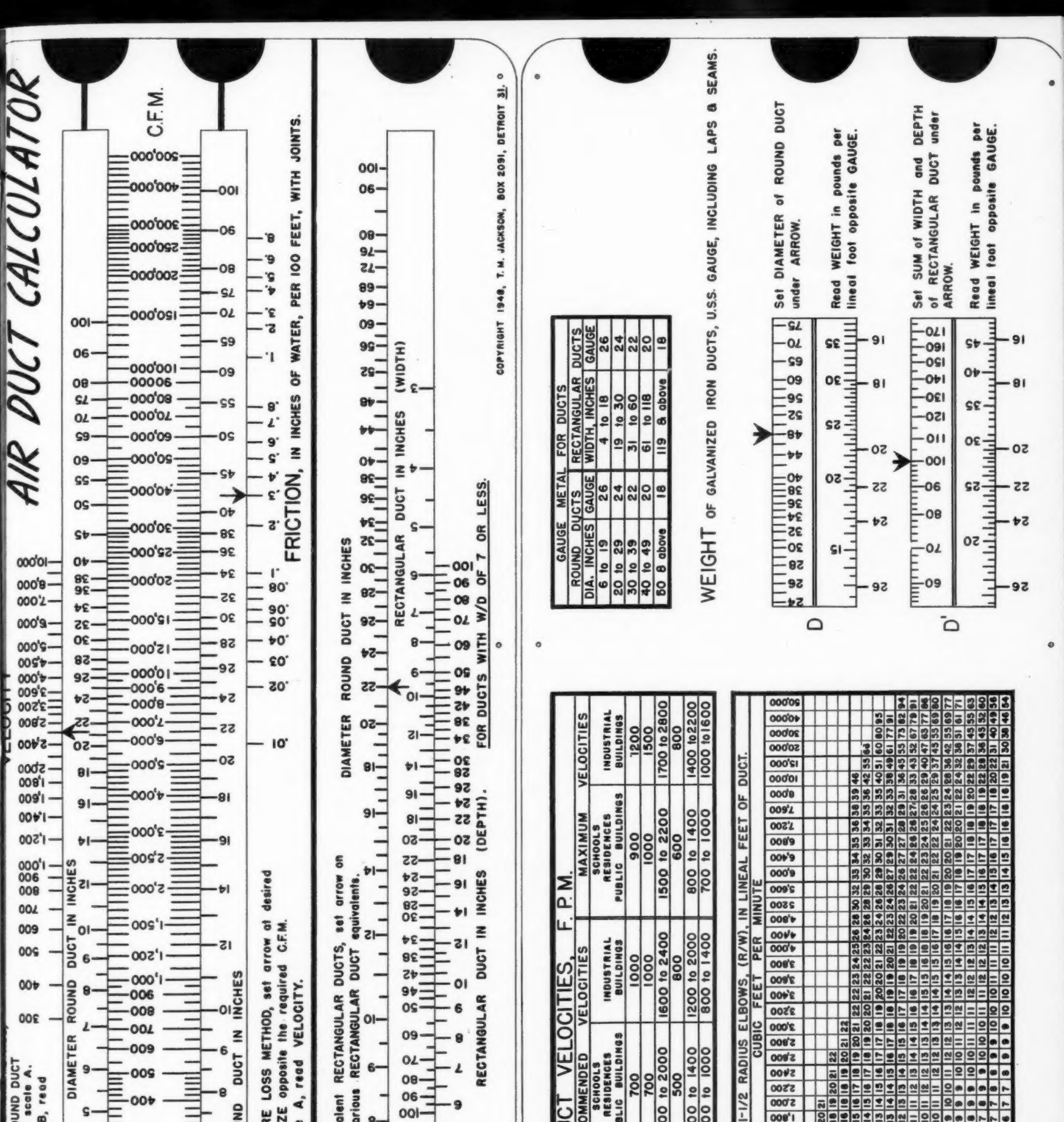
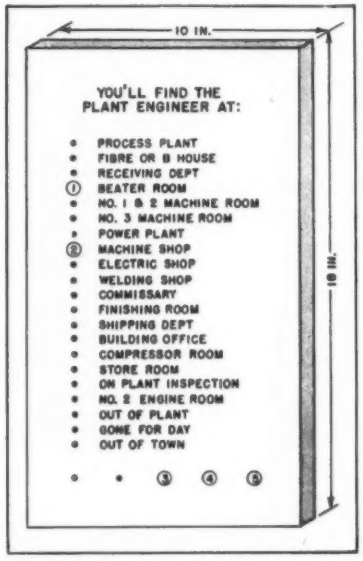


Figs. 3 and 4. The two sides of the Calculator are shown above. The D and D′ scales are shown in detail in Fig. 2. The Calculator is made of three thicknesses of board and the balance of these scales is hidden under the top layer

Maintenance and Operation

Putting a Finger On Plant Engineers

THE JOB OF finding that "hardest of all men to locate"—the plant engineer, has been considerably eased at the plant of Container Corporation of America. This indicator board is made of oak, 10 in. wide by 18 in. high. Names of various departments



This type of plant engineer location board is used successfully at Container Corp. of America, Chicago

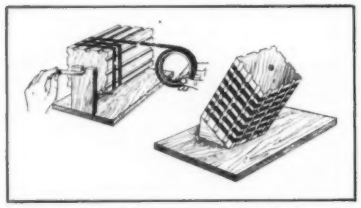
of the plant are printed on the board and small holes are drilled part way through the board just to left of the names.

The numbers on the pegs—1, 2, 3, 4 etc.—indicate the order in which he plans to visit the various departments. Plant engineer at Container Corp. is Don Jennings.

How to Cut Short Tapes

Contributed by Minnesota Mining & Mfg. Co.

WHEN AN electrical installation calls for many short pieces of tape of uniform length considerable time can be saved by cutting a large number of pieces at once so that the installer can pick them off quickly as needed. A simple device for cutting electrical tape in this way and holding it conveniently for use is shown in the accompanying illustration. It consists of a wooden block



To simplify winding tape from the roll to the cutting block the latter is mounted as illustrated on the left and the spindle, with a simple crank handle, is rotated. When wound full and the tape cut the block is placed upright on a base as shown on the right

with longitudinal grooves in it, the groves being shaped so that when a layer of electrical tape has been wound evenly on the block it can be cut quickly with a sharp knife or a razor blade run down each groove.

Roof Patrol

ROOF CLEANING becomes a problem when several acres of roof are involved, as at the Middle River, Md., plant of the Glenn L. Martin Co. Men patrol the roof of each building every two weeks to check every skylight glass, to clean out drains, remove loose slag from roof, dust from cyclone separators, and broken glass.

Handy to Know When Drilling Holes

Contributed by Herbert Bouton

DURING construction work on a large power dam one of the steam engines used for supplying lights for the project developed a dangerous crack in the jaws of the frame holding the main shaft bearings. It was imperative that it be repaired as quickly as possible, so it was decided to bolt a plate on the frame over the crack and so strap the defective parts together. Some sixty 5/8 in. tap bolts were necessary to solidly bolt the 1/2 in. plate in place and when the job of drilling and tapping those holes was given to an old time mechanic, it was interesting to watch his methods on the job.

After shaping the plate to fit the location he laid out the large number of holes on it and selecting two as far apart as possible he drilled those two only at minimum clearance size for his bolts. Then he laid out those two holes on the cast iron frame and drilled them carefully and tapped them out to receive the cap screws. Next, he bolted the plate solidly in position using only two screws to hold it in position. He had

Comment on Heavy Rigging

Contributed by H. A. Delano

THE WRITER has read with considerable interest an article appearing in your magazine, PLANT ENGINEERING—August 1948 issue written by H. B. McDermid on "Heavy Rigging in the Plant."

The paragraph which Mr. McDermid has inserted pertaining to the use of chains shown on page 25 should be corrected we believe in the interests of serving your subscribers with more up-to-date information.

Mr. McDermid states that chains used within the safe limits will after long use become unsafe from fatigue of metal. This is only partially correct as we have never experienced on our Steel and Alloy chains which we are using today any complaint as to the metal actually fatiguing with use.

He also states that chain should be annealed periodically. This probably was accurate when Iron Chain was generally used, but today since most manufacturers are furnishing heat treated steel chains and alloy chains the annealing of the chain is both unnecessary and extremely dangerous.

In annealing these chains the tensile strength is greatly reduced and the usefulness becomes seriously impaired.

In all of our experiences in the manufacture of chain (American Chain Div.) for nearly a half-century we have not found it advisable to anneal any chain which has been treated for better physical specifications, that is, all chains made today of heat treated steel and alloy under no consideration should be annealed.

If there is a doubt in the mind of the operator it would certainly be our suggestion they be returned to their respective manufacturers where they can be re-heat treated and tempered to take care of the loads which the manufacturers' catalogue specifies.

In the interests of safety in plants we believe that this article should be corrected as we are afraid that some users of heat treated steel and alloy chains will follow these suggestions with the result of a serious accident in their plants.

to drill the holes now with an air drill, never a tool for exact spacing, but exact spacing was of secondary importance.

But exact registering of the holes in the plate with those in the casting underneath did matter, as did the limiting of the bolt clearances in the holes through the plate, so here is how he handled that. He chose a drill of proper size for his tap, and with no special care or unusual skill, drilled through both the plate and casting at one setting till all holes were drilled without disturbing the tightly bolted plate. Then he removed the plate, tapped all holes in the cast iron frame. Then with a drill the nominal size of the finished tap bolts he enlarged the holes in the steel reinforcing plate. As all the holes had been drilled at one immovable setting there was very little chance for any to be out of line and they all went in without delay and all fitted closely. This system seems very simple but it brings excellent results where multiple holes must be drilled under adverse conditions.

Questions and Answers

Brain Teaser Un-Teased

Contributed by R. B. Dodds

MY SOLUTION to the Brain Teaser by M. Podell which appeared in the August 1948 issue of PLANT ENGINEERING: First stop at manhole A, connect wires together in pairs. The next stop is at manhole B; here ring the wires to locate the pairs. Number each wire as shown in Fig. 1 and connect wires 1 and 4, 2 and 5,

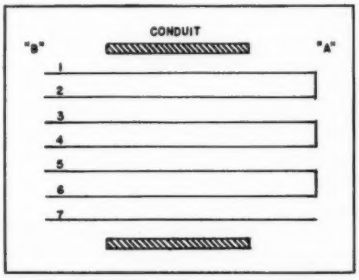


Fig. 1. This drawing shows Reader Dodds' method of connecting the wires at manhole A

3 and 6 together. Then ground wires number 2 and 5 to the conduit, connect 3 and 6 to 7 as shown in Fig. 2. After returning to manhole A keep the pairs together in the same manner in which they were first connected at manhole A but break the connections. Ring the wires to locate the new circuit. Wires 1 and 4 can be identified as only two wires can make the circuit. Wires 2 and 5 can be identified as only two wires plus the conduit can make this circuit.

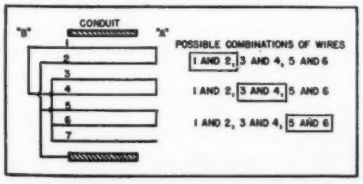


Fig. 2. This sketch shows the various possible combinations of wires as Mr. Dodds would connect them

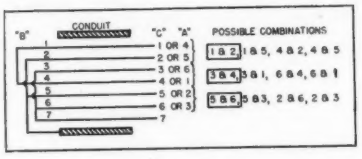


Fig. 3. Possible combinations at the last step, when returning to manhole A

Wires 3 and 6 can be identified in the same manner as 7 is identified and only these two wires can make a circuit with wire 7. Each wire at manhole A can be tagged as being either of two numbers in Fig. 3. By elimination of the possible combinations in Fig. 2 and Fig. 3, column C shows the correctly numbered wires.

Another Brain Teaser Answer

Contributed by Charles P. Ryan

THE METHOD which I have always used to identify conductors in situations such as that outlined in the "Brain Teaser for the Puzzle fans," is the pair method. At manhole A the wires are simply tied in pairs. At manhole B the pairs are then rung out and numbered 1 and 2, 2 and 3, etc. Next, the conductors are paired together by tieing 2 to 3, 4 to 5, etc. If the number of wires is even 1 should be grounded to the pipe to provide the odd wire for identification. Finally, back at manhole A the dead or grounded wire is sought. This is then tagged as 1 wire and its mate is 2. Similarly, by ringing through 2, 3 is found and this method is followed until all the wires are identified.

Readers of PLANT ENGINEERING are invited to submit their comments regarding the above two solutions to Mr. Podell's "Brain Teaser." Answers that are published will be paid for upon publication.

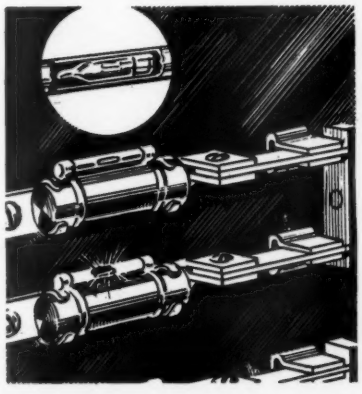
The Safety Man Answers!

Contributed by William N. Davis

IN THE AUGUST issue E.W., New Haven, Conn., asked the following question: When three 60-watt fuses are installed in a box, one or the other of the three burns out frequently and it is sometimes difficult to determine which one. If 90 amp fuses were put on the two outside posts, with a 60 amp fuse in the middle, it would always be easy to determine which one blew out without having to check all three. Is this good practice?

IN ANSWER to this question I might say that the maintenance man who has been doing this stunt for many years, will sooner or later have a fire on one of his circuits. The fire will be due to the fact that one circuit may be shorted in that load range between 60 and 90 amp for a long enough time for the short to start a fire before the load will build up on the 60 amp fuse and blow it. It is true that it would be easy to identify the weakest fuse because the load would finally build up and blow that fuse—the 60 amp fuse.

I would say that this is very poor practice and can easily be eliminated by using a glow lamp on each fuse. The glow lamp will be hooked onto each fuse and so long as the fuse and circuit is alive the lamp will not glow. As soon as one of the 60 amp fuses burns out, the glow lamp will come on identifying this fuse at once. In this way there is no time loss in locating the blown fuse and the con-



By attaching a glow lamp unit across the fuse clips as shown, a lighted lamp indicates that the fuse has blown

sequent shut down of the lighting system while looking for the fuse which has blown. This would also eliminate the hazard of causing a fire and an overloaded circuit.

We can all be sure that when the electrician designed the circuit and specified 60 amp fuses, that is the amperage which should be used, if safety is to be observed.

Readers who are interested in the name of the manufacturer of the glow lamp may contact the Editors, PLANT ENGINEERING, 53 West Jackson Boulevard, Chicago, Illinois.—Editor

Positive Way to Clean Paint Brushes

Contributed by E. J. Kramer

In the May issue of PLANT ENGINEERING a question was asked by S.W.A. of Buffalo. He wanted information on proper methods of cleaning paint brushes, designating that it must be sure and positive. Previous answers have been published.

I have found that the use of a proprietary product with a rather flossy and misleading name gives excellent results when cleaning paint brushes. The product is called "Aunt Sue's French Dry Cleaner." Brushes need not be washed out between paint jobs but merely whipped free of the solution.

When brushes are to be taken out of service wash them with soap and warm water and allow to dry. Then wrap the bristles in paper to keep them straight and to prevent the bristles from separating.

Plant Engineer's Digest

Short articles selected from current publications and condensed for quick reading to save time and give quick reviews of a wide range of industrial topics

The Uses of Dielectric Heating

THE FIELD of radio frequency heating is divided into two major classes —induction heating and dielectric heating. Dielectric heating is used to heat non-conducting materials, such as wood, rubber, plastics, and foods.

The purpose of the heating may be for bonding as used in the gluing of plywood and the making of shatterproof glass, the softening of plastic preforms prior to molding, the curing of rubber, the thawing of frozen foods, or the destruction of fungi in grains and cereals. In other words, dielectric heating is adaptable to forming of practically all non-conducting materials that are processed by heat, where a uniform temperature rise is desirable in the process.

In general, the charge to be heated is placed between two plates or electrodes which are connected to a source of radio frequency energy which oscillates at the rate of at least 1 megacycle, but more generally in the neighborhood of 20 megacycles and heat is generated in the material itself due to its own dielectric losses.

In more specific terms, heat is generated by rapidly distorting the individual molecules electrically with each oscillation of the applied voltage and to some extent heat is also generated by the actual current flow through the material because of the potential gradient across it. The heat thus produced is uniform throughout the charge and does not depend upon heat conduction, so that the usual problems of heat-flow are not encountered. This is important, as all dielectric materials are relatively poor heat conductors.

Due to the method by which heat is generated by radio frequency energy it has many advantages over conventional methods of heating non-conducting materials. Uniform heat is generated throughout the charge and this heat is capable of critical control, as the temperature rise can be as rapid as desired and the generation of heat can be stopped merely by switching off the Radio Frequency power. This means that there is no over-shooting of the heating as a result of heat storage in surrounding parts.

Thus many new materials can be treated at high production rates and with low percentages of rejections that formerly required processes that were slow, which lacked the fineness of control necessary, and which most often depended on conduction of heat through the material. This latter deficiency often resulted in a product with a surface damaged by checks or cracks through uneven or too much heating and an internal structure not thoroughly treated. *From Cathode Press a publication of Machlett Laboratories, Inc., Springdale, Conn.*

Gunite Linings for Tanks

TANK BOTTOMS in sour-distillate service have been protected with concrete for about 18 yr at the Baytown refinery. The first applications of concrete were made to the tank bottoms themselves, but later applications included a gunite lining extending about 18 in. up the shells of the tanks. Because of the good results obtained with coatings of this type, gunite coatings were applied to the entire shells, roofs, and structural members of several tanks. The results obtained were satisfactory, and it is now common practice to gunite the inside surfaces of essentially all tanks in rundown and intermediate sour-distillate service.

The guniting of a tank is accomplished in three separate operations. These consist of the preparation of the surface, installation of the reinforcement and application of the gunite.

The final cleaning of the tank in preparation for guniting consists of sand-blasting to bare metal. It is common practice to sand-blast new tanks to remove mill scale. The application of reinforcement to the bottom, shell and roof of a tank differs somewhat with each portion of the tank. The reinforcement for the bottom of the tank usually consists of 0.25 in. steel rods placed on 18 in. centers. Ten-gage steel mesh, 3 in. by 3 in., is placed over the rods and tied at the corners of the squares formed by the 0.25 in. rods with 16-gage wire. As the gunite is applied, the reinforcement is raised so that it will be at or near the center of the layer of gunite.

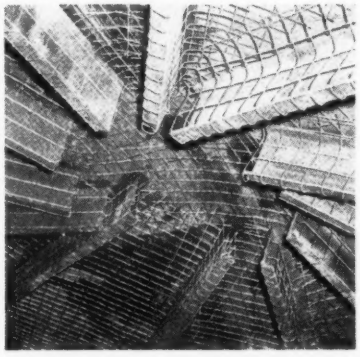
The reinforcements on the shell consists of 0.25 in. rods placed vertically with a horizontal spacing of 18 in.

These rods are then tack-welded to the shell on 18 in. centers and are bent away from the shell about 0.125 in. between each weld. Ten-gage wire mesh is placed over the rods and ties on 9 in. centers with 16-gage wire. Reinforcing is cut along the edges of the door-sheet to facilitate removal of the door sheets.

Roof reinforcement consists of 0.25 in. rods tack-welded on 15 in. centers. (See illustration). These rods are placed parallel with a maximum spacing of 15 inches. Ten-gage steel mash, 3 in. by 3 in., is placed

over the rods and is tied to the rods on 6 in. centers with 16-gage wire. The rafters and other structural members are covered with wire mesh, 3 in. by 3 in., which is tied in place with 16-gage wire. The structural members of new tanks are wrapped with wire mesh before the roof plates are installed.

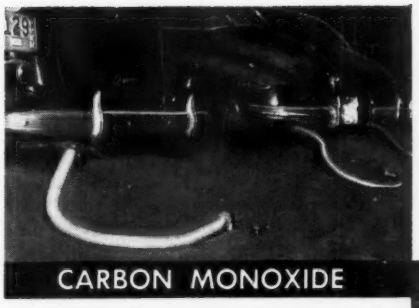
A gunite lining consists of one part cement and three parts sand and is usually applied with a Type N-1 cement gun. Clean washed sand, with a nominal moisture content, is used. A standard brand Portland cement is used. The gunite is applied to a 1 in. minimum thickness on the shell, roof and structural members, and to a 2 in. minimum thickness on the bottom.

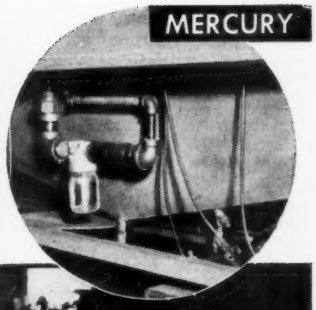


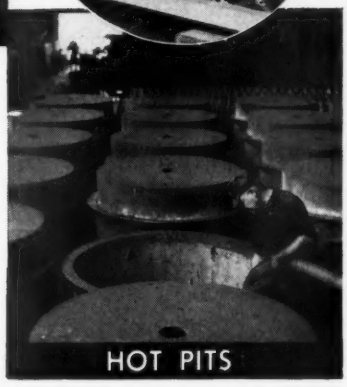
The top photograph shows a tank roof all ready for guniting. The photograph at the bottom shows the completed job

The sequence of applying gunite is from the top of the tank to the bottom. The work is usually done from floats which necessitates filling the tank with water and withdrawing it as the work progresses. The gunite lining is usually cured by keeping it moist for a minimum of 48 hours. In some cases, steam may be admitted to the tank to facilitate curing.

The cost of applying a gunite coating is in the order of 50 to 60 per cent of the cost of a new tank. The application of gunite coatings to a tank is justified on the basis that they at least double the life of a tank. Normally, it is expected that gunite linings will more than double







HANDLING *fumes, liquids and hot materials* WITH SPENCER VACUUM

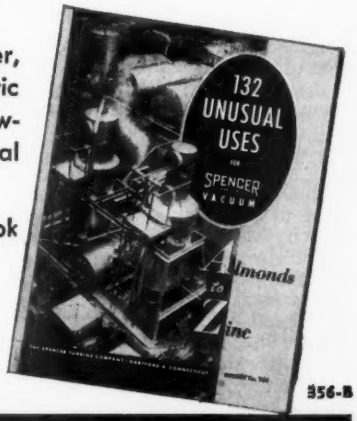
Spencer Vacuum is not new to industry, but more than 100 unusual applications in industry have been used for the first time during the past few years.

This impetus came with the surge of war production, requiring that everything be done well and quickly, and that the heretofore impossible be done immediately.

No man can work in a hot pit, pick up globules of mercury with a spoon, or chase carbon monoxide gas out of a garage with a fan. Yet Spencer Vacuum does all three jobs almost automatically.

Spencer provides the vacuum power, the special hose and tools, automatic dumping mechanisms, and the know-how based on hundreds of special applications.

All you have to do is send for the book of "132 Unusual Uses" and use your ingenuity and imagination to discover a highly valuable application for your plant.



356-B

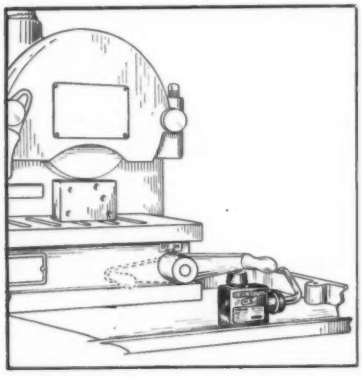
SPENCER HARTFORD VACUUM CLEANING

THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.

the life of a tank. The maximum life of such coatings in sour-crude and sour-distillate services has not been established. *From the August issue of Corrosion, Official publication of the National Association of Corrosion Engineers, Southern Standard Bldg., Houston, Texas.*

Switch Solves Safety Problem

AFTER SOME near accidents, one plant engineer solved a safety problem on a magnetic chuck type surface grinder in the following manner. In some cases the grinder motor had been turned on by the mechanic before the magnetic field circuit was closed. Sometimes this caused the grinding wheel to throw the work from the magnetic chucking table. To insure that the work was held in position when the grinder was started, a snap-action switch was connected



This drawing shows the location of the snap-action switch as applied by this plant engineer to a safety problem on a grinder

into the magnetic chuck circuit and mounted on the table of the machine. When the magnetic chuck control handle is turned to the "on" position, the plunger of the switch is actuated, thereby closing the grinder motor circuit and permitting starting of the wheel.

This hookup prevented the operator from turning on the grinder without also applying the magnetic force to the chucking table. A sealed switch was selected for this application in order that the enclosed switching element might be protected from dust, abrasives, and the occasional splash of coolant. *From Micro Tips, a publication of Micro Switch, Freeport, Ill.*

Selecting Boiler Operators

THE FOLLOWING rules and suggestions are made to supervisors of plants and boiler rooms as a partial remedy to situations where damage and accidents may occur due to carelessness of operators: (1) Select operators who are sober, industrious and intelligent and make clear to them what their responsibilities are. (2) Make sure that the operators understand the construction of the boiler and the damage that may result if it is not properly operated and cared for. (3) Do not give the operators duties which will claim their undivided attention away from the boiler.

In the case of operators or attendants responsible for automatically controlled boilers the following suggestions are made in addition to the first two items listed above: (1) Make sure that all operators or attendants understand the purpose of the automatic controls on the boiler and the basic principles on which they operate. The manufacturer of the boiler or of the controls can give assistance in this respect. The Company's inspector also will be glad to aid. (2) Establish and insist upon some responsible person making routine tests of the automatic controls.

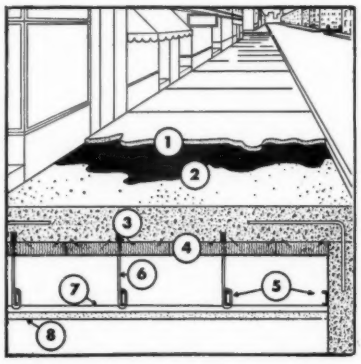
The manufacturer of the boiler or of the controls can advise what should be done in this respect and the inspector will always be willing to give his assistance. (3) Establish and insist upon a program of periodic overhauling and repair of all automatic devices as necessary. In some cases an experienced mechanic in the employ of the owner may be trained so that he will be competent to do this work. In other cases the best plan may be to have the work done by an outside service organization recommended by the manufacturer of the boiler or of the control.

There is no question but that many accidents can be prevented and costly interruptions to production be avoided if the above suggestions are followed. *From The Locomotive, a publication of The Hartford Steam Boiler Inspection and Insurance Company, Hartford, Conn.*

Sidewalk Insulation

A CEILING for a salesroom underneath, and a sidewalk for the street above, are one and the same construction as shown in the accompanying drawing. For what appears to be a cork insulated sidewalk is in reality just another application of insulation, done at street level. Underneath this unusual sidewalk is an air-conditioned salesroom for the new S. S. Kresge Store, Erie, Pennsylvania.

Cork was specified to prevent the cold sidewalk from chilling the ceiling of the salesroom underneath. In wintertime, when outdoor temperatures drop, the sidewalk becomes chilled. If this cold were allowed to carry through to the salesroom beneath, water from the warm and moisture-laden air within the room would condense on the ceiling. This condensation would spoil the ceiling finish, and during prolonged spells of winter cold, would drip from the ceiling to the merchandise on display.



This drawing shows the general construction of the insulated sidewalk and the ceiling which was hung beneath it
The numbers on the drawing are identified as follows: 1 sidewalk paving; 2 waterproof membrane; 3 concrete slab; 4 Corkboard, 2 in.; 5 channel irons; 6 hanger rods; 7 cross furring; and 8 plaster ceiling

In the summertime, the corkboard prevents sidewalk heat from entering the air-conditioned salesroom. A 2 in. layer of corkboard was laid on temporary wood forms. The concrete ceiling slab was then poured over the corkboard. Special galvanized nails, driven obliquely into the surface of each piece of corkboard, assured a secure bond for the concrete to the insulation. After the concrete slab set, wood forms were removed and a suspended ceiling of small channel irons, wire netting, and plaster was constructed about 18 in. below the surface of the corkboard insulation. *From the June issue of Armstrong's Insulator, a publication of the Armstrong Cork Co., Building Materials Division, Lancaster, Pa.*

Be Careful When Installing Lights

THE GENERAL fire record of fluorescent lights has been good, but care is needed in installation. As an illustration, an office in the fifth story of a manufacturing building had just been remodeled and air-conditioned. Recessed light fixtures of the hot cathode type had been installed between joists in a suspended ceiling. The remodeling job was in general a good one. Automatic sprinklers had been retained under the roof, and additional sprinklers had been installed beneath the false ceiling, all in accordance with standard practice.

There was, however, one vital defect. Insulating batts of fiber glass had been laid loosely across the top of the joists, resting directly on the

lighting fixtures. The result was that the asphalt-impregnated paper which covered the batts was in contact with the fixture, and concealed spaces were formed between the joists where fire could burn and spread out of reach of water from sprinklers.

An electrical breakdown of a ballast unit on top of one of the fixtures resulted in overheating which ignited the paper. Flames spread along the paper, set fire to the joists of the false ceiling, and burned in the channels between the joists. Heat progressively opened seventy-seven sprinklers under the roof overhead, but the fire was out of reach. Firemen removed sections of the ceiling and tried to extinguish the fire, using six small hose streams, but flames kept breaking out in many places. In half an hour the fire subsided and sprinklers were shut off. Flames then broke out vigorously again and it was necessary to turn on sprinklers once more. Finally the men had to chop through the roof to put out the fire. In reconstructing the ceiling after the fire, the insulation was packed between the joists to avoid hollow spaces, the paper covering was removed where it would be exposed or in contact with the fixtures, and no insulation was placed on top of the fixtures.

Standard approved installations recessed fixtures as defined by the National Electric Code, calls for a clearance of ½ in. or more between the fixture and the combustible materials, except at points of support. The location of the ballast unit is also important. The one which failed in the above case, was inside a wiring compartment in the fixture, and in contact with the top of the fixture, which also had several holes. This arrangement permitted sparks and heat to be transmitted readily to the paper outside. It would be safer to place the ballast away from contact with the fixture top, and to eliminate unnecessary holes. Wiring inside the fixture should have asbestos-covered insulation, which is heat resistant. Most of the reported fires in fluorescent lamps have been due to electrical failure of the ballast unit of hot cathode lamps. A loose contact in a lamp-holder at the end of a fluorescent tube is known to have caused one large fire. A loosely fitting tube resulted in a slight arc which increased as the plastic tip of the tube became carbonized. Combustible insulation on the wiring ignited and the fire spread rapidly.

Cold cathode fluorescent lamps are of a different type. They light instantly when energized. This is because high voltage is used to discharge electrons from the cathodes at the end of the tube; hot cathode lamps by contrast require a second or two to light up, while the low-voltage current heats the cathodes sufficiently to emit electrons. Cold cathode lamps, usually 6 ft long or more, require individual transformers but have no ballast unit.

Careful installation of the high voltage wires between transformers and light tubes is the principal fire-safety measure of cold cathode lamps. One outstanding fire in a fruit packing plant emphasized that point; the high voltage wiring, located in a concealed ceiling space, was not well installed. Roof leakage wet the wiring, arcing resulted, and fire destroyed the plant. Some cold-cathode lamps have the transformers mounted on the fixture, with no high voltage wiring outside the fixture itself. This is the preferred method. In any other arrangement the transformers should be located as near the fixture as possible, to reduce the length of the high voltage wires. Keep the transformers accessible. Limit voltage on the high side to 15,000. Use wires of adequate capacity and appropriate insulation. Installation in rigid or flexible metal conduit, electric metallic tubing or other approved metal race-way is recommended. *From Factory Mutual Record a publication of Associated Factory Mutual Fire Insurance Companies, Boston, Mass.*

Carries Away Overspray . . .
IN A WHIRLING TORNADO OF WATER

PAINT-LADEN AIR IS "TORNADO" CLEANED. Operators, working in a Schmieg Centri-Merge Spray Booth, are adequately protected from fire and fumes. Overspray is carried on an air stream *horizontally* away from work into a curtain of water, pressure-fed through slots extending continuously full width of booth, that descends down the flood sheet. The mixture of fume and paint-laden air and water is then whirled under the flood sheet and hurled with tremendous impact against the impingement wall at back of booth. Down this impingement wall flows an additional sheet of water that floods the foreign matter, pounded out in the process, into the sludge tank below. Only CLEAN AIR passes through exhaust fan. Thus the danger of fire is suppressed both in front and behind the flood sheet. Because the ratio of water and air is far greater in Centri-Merge, paint and other gummy substances do not pile up on the hard-to-get-at walls of the chamber behind the flood sheet; therefore, cost of repeated cleanings is eliminated.

Consult Schmieg engineers regarding your problems of dust and fume control.

THE best AIR PURGE is CENTRI-MERGE

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Plant Engineer's Library

Distilling and Rectifying*

Distillation and Rectification by Dr. Emil Kirschbaum. Size 5½ by 8½ in.; 430 pages; illustrated. Published by Chemical Publishing Co. Price $10.00.

THIS BOOK is the first English translation of this authoritative reference work, regarded by many as a classic in its field. Every phase of distillation and rectification engineering is thoroughly covered and the many diagrams and charts will be helpful in practical work and student use.

The treatment is strictly scientific. Structural details of apparatus and other factors important to an engineer, have also been considered. Instead of specific industries, principles and generally suitable designs have been stressed and the numerical and descriptive examples have been referred to the specialized industries. As far as possible, graphical methods have been used in preference to methods requiring involved calculations. The tables and graphs will be helpful to those engaged in the petroleum, gas, alcohol, solvent, rubber, drug and other industries.

Electronics Handbook*

Industrial Electronics Reference Book by 37 Electronics Engineers of Westinghouse Electric Corp. Size 8¾ by 11½ in.; 680 pages; completely indexed; published by John Wiley & Sons, Inc. Price $7.50.

THIS IS a reference book designed to help electrical engineers understand and apply new electronic equipment in industry. The book contains 36 chapters on the basic theory of electrons and the design, application and maintenance of electronic equipment in industry. This handbook includes within one cover all the technical data needed to understand the scope and limitations of electronic equipment as used in industry.

The volume will be useful to engineers faced with the problem of approving or rejecting industrial electronic equipment.

The chapters, all well illustrated, were written by engineers and research scientists who have made many contributions to the rapid development of the field of electronics. They include Dr. W. E. Shoupp and Dr. Harvey C. Rentschler, the man who developed the bacteria-killing Sterilamp.

Besides presenting underlying theories and design factors, the book brings the electrical engineer up to date on developments in electronic instruments, motor control, dielectric heating of woods and plastics, resistance welding, X-ray and photoelectric devices and many other fields of electronics.

Chapters 1 through 3 cover the basic laws governing the production and control of electrons, the kinetic theory of gases, atomic structure and the electronic theory of solids. Chapters 4 through 10 embrace the design, operation and construction features of different types of electronic tubes—vacuum tubes, gas tubes, X-ray tubes, cathode ray tubes, photoelectric devices and ultraviolet radiators.

Electronic circuit components including resistance forms, capacitance, oscillators and control circuits are presented in Chapters 11 through 18.

The design and application factors relating to transmission lines and antennas are covered in Chapters 19 and 20. The many different types of industrial equipment, including power line carrier equipment, power rectifiers and inverters, radio frequency heating and electronic instruments, are presented with their advantages and limitations for industrial use. This book is easily worth three times what it costs.

Spraying Metals

Metal Spraying and Sprayed Metal by W. E. Ballard. Third edition; size 6¼ by 9 in., 360 pages; 216 illustrations and 61 tables; cloth bound. Published by Charles Griffin and Co., Ltd., London; distributed in this country by American Metallizing Contractors Assn., 773 Brownell Ave., St. Louis 22, Mo. Price $10.00.

Previous editions of this book were written by men who had a purely scientific interest in the subject, but this does not apply in the case of Mr. Ballard who has been connected with the commercial development and application of metal spraying for twenty four years in England.

The book gives a complete coverage of the subject of metallizing; it deals with the use of both American and foreign equipment and describes fully the molten metal process, the powder process and wire spraying. Another subject given complete coverage is the preparation of surfaces for metal spraying. The installation of the plant and subsidiary apparatus is considered in detail. The section dealing with "Properties of Metal-Sprayed Surfaces," is one of the largest in the book, covering 81 pages.

An asterisk (*) following the title of any book described in this department indicates that the book may be purchased from the Book Department, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill.

Wear and Lubrication

Wear and Lubrication of Piston Rings and Cylinders by Dr. Reemt Poppinga, translated from the German by Dr. Edmund Kurz. Size 5½ by 8½ in.; 200 pages; cloth bound. Price $3.50. Published by The American Society of Lubrication Engineers, 353 S. Dearborn St., Chicago.

This book presupposes a certain amount of basic information concerning the causes of wear simply because, despite tremendous amounts of research on the subject, all causes of wear have yet to be determined. Numerous data upon which this book is based were made available to the researchers by the Reich Ministry of Transport and other German organizations.

Investigation was made, and is reported in the book, on the influence of the lubricant upon wear and also on the influence of engine operating conditions upon both lubrication and the wear of cylinders and piston rings.

For Electron Microscope Owners*

The Electron Microscope by Dr. D. Gabor. Copyright 1947; size 5¾ by 8⅛ in.; 160 pages; illustrated; cloth bound. Published by Chemical Publishing Co., Inc. Price $4.75.

This book is both an introduction to the use of the electron microscope and a critical contribution to the theory of this latest of industrial and laboratory aids. All construction details of the microscope are given and the preparation of specimens is discussed. An important feature of the book is the indication of future possibilities and trends of developments of the instrument.

The "commercial" electron microscopes such as the RCA magnetic floor (Type B) and desk models as well as German, British, French and Dutch industrial types are discussed in detail.

The fundamentals of electron optics explained in the book should enable workers, who have no theoretical acquaintance with electronics, to understand the basic operation of the instruments dealt with in this volume.

Investigation of Highway Bridges

Studies of Slab and Beam Highway Bridges, Part II, by Nathan M. Newmark, Chester P. Siess and Warren M. Peckham. Copyright 1948; size 6 by 9 in.; 62 pages; illustrated. Published by University of Illinois, Urbana, Ill. Price 50 cents.

This booklet is a report of laboratory tests made on five I-beam bridges. The structures tested were quarter-scale models of simple-span bridges. A complete description of test methods and findings are reported in the bulletin.

New Products and Methods

(Continued from page 20)

frame over the bottom face of the pallet so gently that even an empty pallet is not displaced from its position by inserting the truck. The short stroke vertical pump handle enables the operator to elevate the load under the most congested conditions. A hand operated release valve permits fast or slow lowering speed. The new Leverlift is of pressed steel arc welded construction for maximum strength and minimum weight. All parts of its simple hydraulic lifting mechanism are quickly replaced. A built-in hydraulic safety valve prevents overloading. The truck is available only in 4000 lb capacity. Lowered heights is 3¼ in. and the lift is 4 in.; overall height 27 in. 10 in. dia front wheels are used for easy pulling and steering. The new pallet truck is available in fork lengths of 36, 42, 48, 54 and 60 inches. Service Caster & Truck Corp.

VIBRATOR PACKER

66 Announced is the addition to a line of paper joggers and vibratory packers of a new small model with built-in variable control power, a 7 by 10 in. wooden deck standing 4½ in. high and weighing but 13 lb.

It is a portable piece of equipment that can be used for jogging, feeding or binding; aligning quantities of invoices for filing; for completely filling small phials, jars, cartons, or cans with bulk materials. Syntron Co.

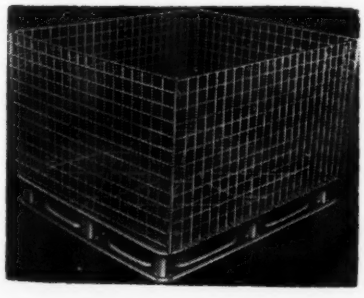
HYDRAULIC LIFT TRUCK

67 This new 3000 lb capacity high lift truck is built with four-wheel suspension, auto steer and towing eye. It is a mobile, easily operated truck that lifts, elevates and transports capacity loads, supports heavy overhanging work, serves as a feeding table for heavy, tough operations, simplifies and eases the handling and positioning of dies and other tools and fixtures, and is versatile in tiering skid loads and stacking a wide range of materials and containers.

The fork type tubular frame provides a 30 by 36 in. load platform, which is supported by concave rollers fitted to the tubular uprights. Power is furnished by two speed hydraulic hand pump which is mounted on the truck frame. The platform has a range of elevation from 6 in. lowered height to 54 in. elevated height. The overall height of the upright is 83 in. Lyon-Raymond Corp.

PALLET BOX

68 This collapsible pallet box utilizes an eight-way, all-steel, 40 by 48 in. pallet as a base, and has 8 ga steel wire sides 24 in. in height, forming a container for handling and shipping of locse material. When not in use or when being returned empty, the wire sides fold down compactly onto the top of the pallet, forming a unit only 7½ in. in depth. The collapsible pallet box is available with either the heavier pallet weighing 96 lb or the lighter pallet weigh-

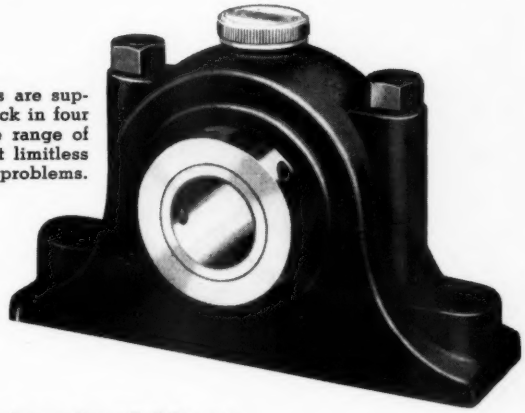


TWO GREAT NAMES... DODGE-TIMKEN!

It was Dodge who took the famous Timken Bearing, mounted it, sealed it, housed it and delivered a pillow block of new high quality—fully assembled, ready to lock on the shaft and carry the power loads of industry with new efficiency.

Dodge develops *outstanding* power transmission products, as proved by the big success of Dodge-Timken Bearings on millions of industry's toughest jobs.

Dodge-Timken Bearings are supplied promptly from stock in four basic types and a wide range of sizes to meet an almost limitless variety of anti-friction problems.



Dodge also produces Ball Bearing Pillow Blocks which, with Dodge-Timken Bearings, comprise the famous "30,000 hour line." Write for complete bulletins.

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NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

New Products and Methods

ing 69 lb. Empty, the complete pallet box on the heavier base weighs 169 lb, and on the lighter base, 142 lb. The pallet, made of high tensile steel in corrugated, crimped design that eliminates welding, and the steel wire sides, are said to permit capacities ranging from 2,500 to 5,000 lb in single loads, and 15,000 to 35,000 lb in tiered loads for which stakes are available when needed. The pallet box will hold nearly 27 cu ft of material. Monroe Auto Equipment Co.

PHONO-PA SYSTEM

69 This 16 in. transcription phono-PA system, Model 2079, features heavy duty dual speed motor and turntable, professional type crystal

tone arm, 5 w power output, 2 microphone inputs, bass boost hi cut tone control, separate microphone and phono controls, 8 in. speaker, and 25 ft of speaker cable. Bell Sound Systems, Inc.

MOTORIZED TRUCK

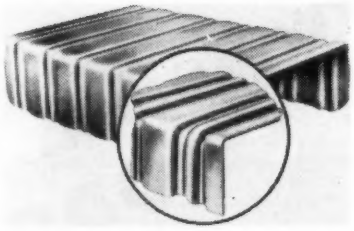
70 Designed to save the time and effort of the dock worker so that he may accomplish more is this hand truck driven by a gasoline engine.

Truck will handle up to 1500 lb on short steep inclines or 2000 lb on level hauls. Comet Mfg. Co.

PLATFORMS

71 Double corrugated one-piece skid platforms, made of aluminum, have recently been announced. The double corrugations consist of two recessed corrugations joined by a raised center rib.

In the construction of platforms, the metal is allowed to flow freely in especially constructed dies, enabling the legs to be bent down from the deck without buckling or fracturing the metal. The raised center rib between the two corrugations acts as a built-in knee brace, thus strengthening the legs and greatly reducing the danger of their being bent outward by power truck abuse. Another advantage is that blows and bumps are absorbed by the knees. With this type construction the knee becomes the strongest part of the skid platform. Union Metal Mfg. Co.



HAND FILE

72 New Severance hand files of cemented carbide featuring ground teeth are now available having either 20 or 30 teeth per inch, and in either ¾ or 1¼ in. widths.

The file is comprised of a combination hand-holder on which are mounted in tandem two carbide segments. The handle is shaped to fit the hand, and has a thumb

rest and knuckle guard. A forward lug provides a convenient finger hold, and has a hole for hanging the file or attaching an extension. The flexibility of mounting—such as a coarse and a fine segment on the regular holder, or multiples on special holders—is combined with the precision of flatness obtained by grinding. Tests indicate these files will cut steels no ordinary file will touch (up to Rockwell 62-C). Segments may be removed from the holder and returned to the manufacturer for regrinding. Severance Tool Industries Inc.

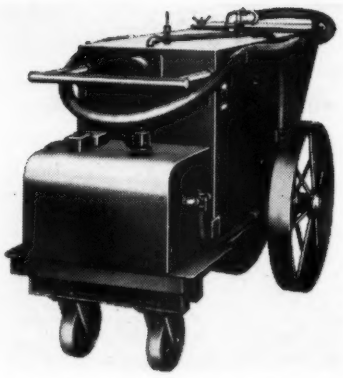
CUP WATER COOLER

73 The Super Cooler not only cools drinking water, it also refrigerates a storage compartment of 2 cu ft and freezes three trays of ice cubes.

It is designed for the business office. It will keep the thirst of 10 to 15 persons quenched and, at the same time, cool beverages and other perishables for noontime lunches. Sunroc Refrigeration Co.

SUMP CLEANER

74 This unit removes chips, grindings, cutting oil or soluble coolant from machine tool sumps; or scale and other contamination from quench and settling tanks. The Sump Cleaner transfers oil or coolant from sump to tank by vacuum and no contaminated liquid pass through the pump. Unit will transfer liquids from below floor level, max 20 ft, water.



A three-way valve instantly changes suction to pressure, permitting the unit to be used for dispensing clean liquids as well as removing dirty liquids. A hermetically sealed mercury contact switch, mounted on the Sump Cleaner and actuated by a float lever mechanism, automatically cuts out motor and pump units when the tank is filled. Each unit is equipped with a drain valve for drawing off any liquid with salvage value before dumping. It is mounted on large wheels and the tank is balanced to permit quick, easy tilting for dumping of contents. Two sizes are available, with either 80 or 125 gal capacity. Standard equipment includes a ½ hp repulsion induction motor with V-belt drive, and starting switch; also a 10 ft heavy duty extension cord with plug and a 10 ft 1½ in neoprene suction hose with 30 in nozzle. Pump and motor units are fully enclosed in a sheet metal housing. Tank, frame and wheels are all steel and a heavy neoprene gasket seals the tank lid. Honan-Crane Corp.

ELEVATOR CONVEYOR

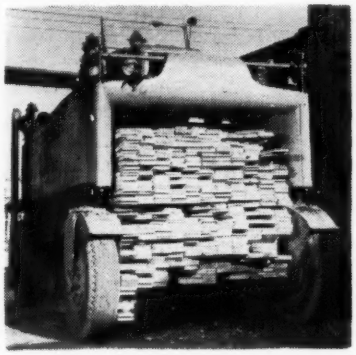
75 An elevator conveyor that can operate at 25 to 45 deg carrying a load up to 500 lb and 8 to 24 in. wide of any reasonable height and length, has been announced. Approximate speed is 50 fpm ascending or 100 fpm

descending when powered by a ¾ hp motor. The conveyor can be furnished with any type of controls wanted. Extra equipment for long hauls or multi-floor conveying is available. Wehle Conveyor Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

STRADDLE TRUCK

76 Powered by an industrial type heavy duty engine this straddle truck is claimed to have the following features: Streamlined design to avoid catching on projections, all electric welded frame in one unit, full reversing 5 speed selective transmission, truck type clutch, positive raising and lowering mechanism, easy to change tires. Alemite



Zerk lubrication system, individually sprung wheels with shock absorbers, steering gear that turns all 4 wheels in unison, 15 ft turning radius, brakes are hydraulic Lockheed 2 shoe internal expanding. For mill operations maximum speed is 30 mph, 55 mph available for highway use. Cu ft capacity is from 800 to 1060 with four models to choose from. Hyster Co.

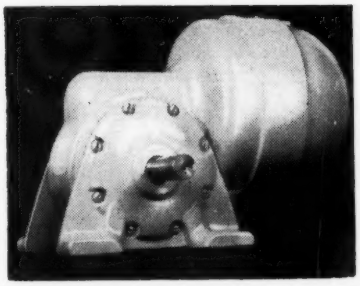
INTERVAL TIMER

77 Electronic timer, Series 30, is designed for machinery and process control. It has a range of from 0.03 sec to four min. It is recommended by the maker for the control of hydraulic presses, chemical feeders, spot welders, grinders, conveyors, drilling machines, photographic printers, and similar equipment. This single timer may be wired to provide interval timing, delayed action,

automatic repeat, and programming as well as many variations of these. The unit has a repeat cycle accuracy of 2 per cent. Specifications are: Supply, 115/230 v, 50-60 cycles; output, two single-pole, double-throw switches; relay contact rating, 10 amps, 115 v ac; ambient temperature, 32 to 150 F; ambient relative humidity, 20 to 95 per cent. Photoswitch, Inc.

GEARMOTOR

78 The Gearmotor is a light-weight, compact unit combining the Electra-Motor and a right-angle single reduction wormgear type speed reducer, with gear housing and motor frame in one piece. It is manufactured in two models—foot mounted (Series 400) and ring mounted (Series 500), for 3, 2, and single phase ac operation, in ¼, ⅓, ½ and ¾ hp sizes. All are of the general purpose, continuous duty type, with ball and tapered roller bearings. The motor can be assembled in any one of four positions and the entire unit can be operated at most any



desired angle. In the ring mounted model, a positive seal prevents gear oil from leaking into mixing chambers or other equipment and thus prevents contamination. A wide range of speeds is offered. Electra Motors, Inc.

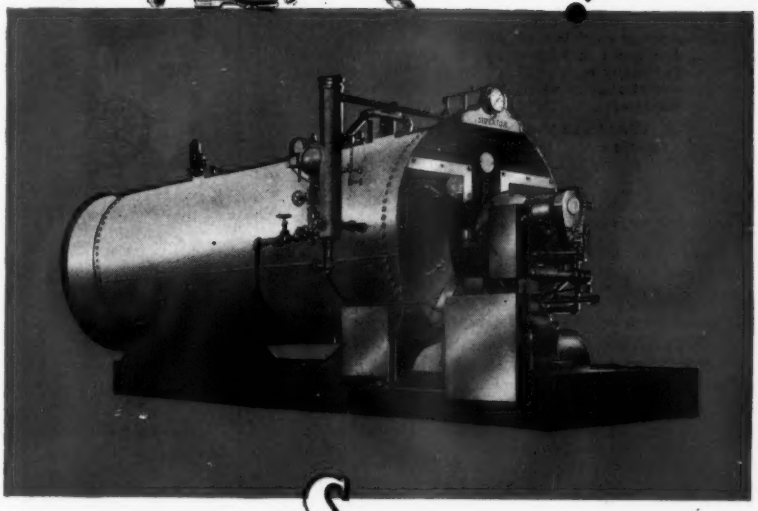
New Products and Methods

FEEDING TABLE

79 Hydraulic sheet feeding tables of 4000 and 6000 capacity are now available in a synchronized dual pedestal design. Standard base sizes are offered on which may be fastened tops of various widths to accommodate the desired sizes of sheets or strips. A 30 deg tilt top is offered as an optional extra.

The single speed hydraulic foot pump with 5 ft of flexible hose enables on operator to conveniently increase the elevation from 24 to 36 in. without moving from his normal press feeding position. The table is fitted with two heavy duty swivel cast-

THOROBREDS BOTH



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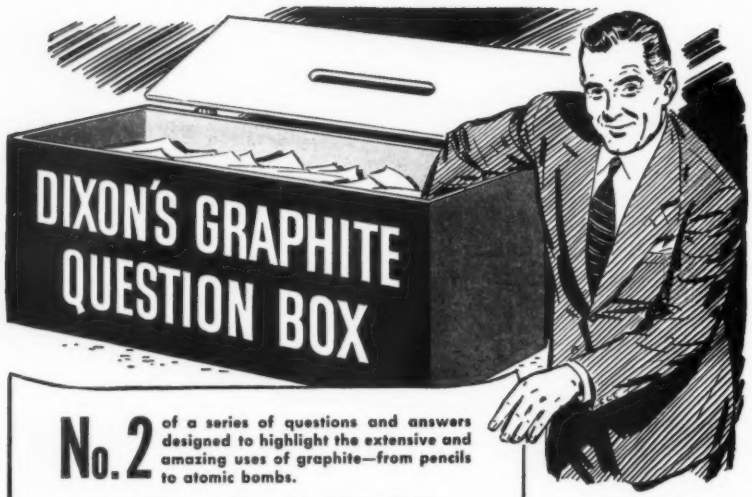


No. 2 of a series of questions and answers designed to highlight the extensive and amazing uses of graphite—from pencils to atomic bombs.

SOURCE AND PROPERTIES OF GRAPHITE

QUES. Are all graphites—varying in type, purity and particle size—suitable for the same uses?

ANS. Definitely not. In nearly every case, each application governs the selection of graphite in type, purity and particle size. Lubricants require the crystalline types of highest purity. Electrical applications usually require high purity. The lower purity grades of natural amorphous graphites find less exacting uses.

QUES. What are the characteristics of graphite that make it one of mankind's most useful industrial minerals?

ANS. It is extremely lubricous or slippery, lustrous, oil-and-grease-free (unless processed with such), and withstands excessive heat, cold and pressures. It neither destroys nor is destroyed by contact with water, oil or any chemical. It is electrically conductive, heat conductive, non-magnetic, non-fusible, non-toxic, non-odorous and does not permanently stain. It adheres tenaciously to almost all substances and has a low co-efficient of expansion.

QUES. What was the first product made from graphite?

ANS. Pencils, in 1554.

QUES. Is graphite processed into all required forms and shapes that make it usable for innumerable manual, mechanical, chemical, and electrical applications?

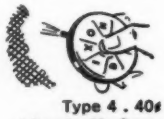
ANS. Graphite owes its remarkable versatility to its almost unlimited scope of form and formulation. It is available in a wide variety of microscopic powders, large flakes, fluids, non-fluids, concentrates, bars, tubes, sheets, plates and specially processed shapes.

QUES. In what products or processes is graphite now principally used?

ANS. Lubricants • Pipe joint seals • Mechanical packings • Gaskets • Brake linings • Sand and metallic molds • Lustrous heat-resisting polishes • Protective coatings • Crucibles and refractories • Electronics • Electroplating • Electrodes • Dry batteries • Motor and generator brushes.

A few of thousands of widely used products containing Dixon's Graphites. Those starred are Dixon's products, many of them sold by supply houses everywhere.

Cub . . 15¢



Type 4 . 40¢
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★Pipe Joint Compound

★Graphite (pipe joint) Seal

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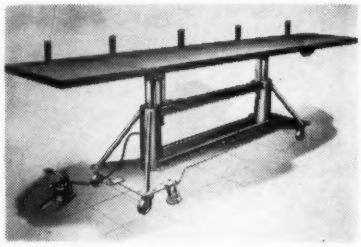
New Products and Methods



ers and two heavy duty rigid casters. A floor lock secures the table in feeding position as required. Lyon-Raymond Corp.

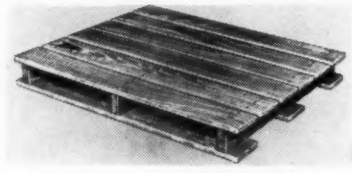
VIBRATION METER

80 For use in determining and measuring vibration in machinery and buildings there is available this meter. The Type 1-110 is a complete self-contained unit requiring no external accessories other than a suitable

pickup and cable. The instrument may be used to indicate practically any type of oscillatory motion. Connection is provided for an external meter or recorder to be hooked in. Dimensions are: 8½ by 10½ by 9½ in. Weight is 16 lb. Consolidated Engineering Corp.

WOOD PALLET

81 This all-wood pallet was designed for both factory and shipping operations. Built of top-grade hardwood with cement-coated helix drive screws, the new pallet has been developed for use with a pallet truck,



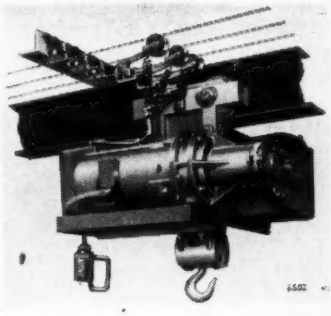
spaces being provided on the bottom to permit functioning of the pallet truck wheels. The wood pallet is offered in three sizes—48 by 48 in., 48 by 40 in., and 48 by 36 in. Monroe Auto Equipment Co.

HOIST BRAKES

82 A new type of automatic self-equalizing motor brake for R & M electric hoists has been developed. It is said to give improved hoist performance, and speed handling and spot-

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

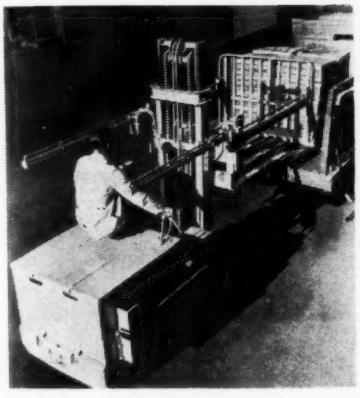
ting operations. Magnetically released, the brake consists of a series of self-aligning circular friction discs, alternated with brake plates attached to the motor shaft. The mechanism is operated automatically by dual-voltage brake coils that correspond to those of the hoist motor. Only a shift of motor connections is required should power source voltage change. When power is switched off, or should power fail, this brake holds the load securely. Brake



adjustment is by means of a single external set screw, there are no covers to remove. Specific advantages claimed for the brake include larger friction areas, freedom from drift, longer life, uniform wear, greater efficiency, smoother braking, minimum maintenance. This new automatic break is now standard equipment on all R & H push button type electric hoists in capacities of 250 to 20,000 lb. Hoists & Crane Div., Robbins & Myers, Inc.

FORK TRUCK

83 Well established for handling material in cartons and bags, in instances where material must be removed from pallets, this pusher is said to make it easy to remove the load as a unit rather than piece-by-piece. In the newly designed pusher, the pusher rack which travels horizontally to move material off the forks, is connected to two hydraulic cylinders which receive equalized hydraulic pressure through a flow divider.

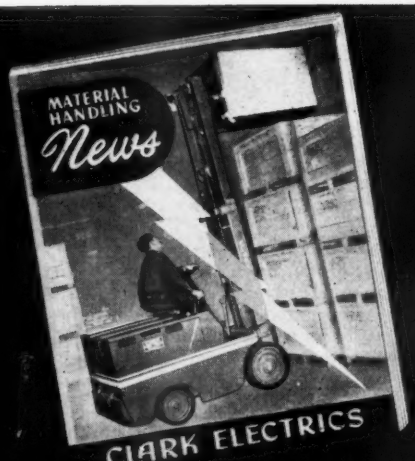


The cylinders are supported by two horizontal slide channels mounted on roller bearings, with the result that the rack travels smoothly and evenly in both directions. Standard and maximum forward travel of the pusher rack is 55½ in. This may be reduced by 1-inch increments to meet special needs. Standard forks may be used for handling palletized unit loads. Where loads are to be removed directly from forks, multiple forks, usually five, are used. Clark Equipment Co.

NEW RIVET STUD

84 A rivet stud has been developed for securing corrugated metal roofing and siding materials to steel purlins and framing, as well as various other applications where a shoulder type fastener is required. In corrugated roofing applications these rivet studs are end-welded in position on the purlin with a stud welding gun. They are located by

CLARK



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means of a simple lightweight template. The operator works from the topside only, and no rigging or scaffolding beneath the roof is required. After the studs are welded, the corrugated sheet is set in place over the studs and the stud extension is driven through the sheets by a rubber hammer. The stud extension is then upset and rounded off cleanly by a machinist hammer and ordinary rivet set. Side laps between the purlins are secured by the usual method of self-tapping screws. Nelson Sales Corp.

LIGHTING SYSTEM

85 This unit is said to supply instant automatic light when the regular power system fails. Each lamp delivers about 100 w and is capable of illuminating an area of approximately 10,000 sq ft for about 5 hrs. The lamp heads are adjustable to any position and may be removed from the unit for installation in halls or stairways. When normal current is resumed the lights automatically go out and a special built-in charger restores power to the battery for the next emergency. No special wiring required, just plug into any standard receptacle. Approved by Underwriter's Laboratories. List Price. $125. Electric Cord Co.

END RACKS

86 A new type all-steel skid with end racks has just been developed. Especially designed for handling heavy loads with ease and safety, it is built of heavy gauge corrugated steel, with sturdy angle iron legs that provide ample clearance for fork lift or hand-operated trucks. Equipped with removable end racks to facilitate loading and unloading, it is excellent for handling hot metal parts, and can also be built with ventilated bottom. Palmer-Shile Co.

SPEED CONTROL

87 An electronic excitation control system, VSC, has been designed to provide the flexibility of electronic control of motor drive speeds with the economy of the rotating motor generator set as an ac. to dc. power converter in the larger sizes. Used with a conventional variable voltage motor generator set, the VSC provides the functions of excitation, preset speed with definite controlled time acceleration and deceleration, and combined voltage and field control with full motor field control when operating in the voltage control range. Either dynamic or regenerative braking can be incorporated. Functionally, the VSC may be compared to a two-circuit, motor-operated rheostat, with a servo-mechanism, preset speed device controlling the output voltage of a constant potential rotating exciter. Through simple internal adjustments, the VSC can be adapted to cover voltage control only or voltage and field control up to a 4:1 motor field range without change of component parts. Consequently, it is only necessary to provide a unit with sufficient current capacity for the fields involved. It can be adapted for any speed range. VSC circuits are applicable to four groups, each of which provides a definite function in the combined operation of the unit. Reliance Electric & Engineering Co.

LIGHT CONTROL

88 Special models of Photoelectric Control are now available for the control of aircraft obstruction lights on radio towers, industrial smoke stacks and other high structures. Controls turn on automatically with unvaried reliability at 35 fc and turn off at 55 fc. Model 61305 is rated to control 500 watts of incandescent lamp load. Model 61306 is rated to control 3,000 watts. Both operate at 120 v, 50 to 60 cycles. Also incorporated is a time delay of 15 seconds in their circuit to prevent it being turned off at night by lightning or any passing lights or beams that focus on it momentarily. These controls are said to be unaffected operationally or physically by wide temperature extremes, high humidity, direct desert sunlight or any other weather hazard. Usual maintenance is a simple matter of replacing tubes about every two years. Fisher-Pierce Co.

LIGHTING CALCULATOR

89 A pocket-size Calcu-light-or approximately 4 by 8½ in. for rapid illumination calculations has recently been developed. Of slide-rule design, the Calcu-light-or includes all of the technical information necessary to make illumination calculations either by the Lumen or Point-by-Point methods. No regular slide rule is required with its use nor are any additional tables or charts needed for Lumen-method calculations. A distribution curve is required for point-by-point calculations. Price $1.00. West-

WATERPROOF PULLEY LAGGING

90 Produced is an entirely new all-purpose waterproof lagging that is quickly and easily applied without rivets, bolts, or heat, and that dries within 10 hours at room temperature.

This tough, wear-resistant, all-purpose waterproof lagging adheres so firmly to all surfaces that a hammer and chisel are required to remove it. In addition, it is weather and corrosion resistant, unaffected by sulphuric acid, oxidizing agents, soaps, alcohol, petroleum products, etc. When dry it is odorless, tasteless, non-toxic and non-inflammable.

It is equally suitable for crown, split and flat pulleys, for use with leather, cord, wire-woven, or rubber belts.

It may be ordered in units consisting of 70 by 40 in. treated fabric and sufficient compound for application, cut to size for any pulley by specifying diameter and face measurements, or in rolls of any width up to 42 in. Condersite Engineering Corp.

PLUMBER'S FLUSHING GUN

91 This device is a gun that uses water and air to clean pipeline stoppages. In use the gun is

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

used to fill the line completely with water. The cylinder, which has been filled with compressed air and which has a quick release trigger on it, is then permitted to exert its full force against the obstruction by reason of the incompressibility of water with a sharp blow. This is said to be sufficient in most cases to dislodge the obstruction. Miller Sewer Rod Co.

LIFT TRUCK

92 Features of the Motowlift are many. All controls and the full-vision instrument cluster are incorporated in the steering column. A single lever at the driver's finger-tips controls all hydraulic operations. The seat frame and floor plates provide immediate accessibility for maintenance. In a matter of seconds the engine and hydraulic system may be fully exposed for inspection and service. Refinements include inclosure of the top mechanism to lessen the drifting of foreign matter into the ram assembly. A heavy duty transmission and improved steering arrangements are further advancements. 3000 and 4000 lb solid rubber tired models in 108 and 144 in. lifts with a pneumatic-tired model also added. Motowlift accessories include a new type of air expanding forks for lifting and transporting concrete blocks, bricks, cases and cartons without the aid of pallets. Scoops, rams, cranes and special forks complete the list of attachments. Service Caster & Truck Corp.

EXTENSION BAR

93 A new radius extension bar has been created. The bar is made of rigid cold-rolled steel, and the adaptor is permanently fixed to the bar by induction silver soldering. The Unit is then cadmium plated to prevent rust. An aluminum set screw with cut threads is set diagonally on the adaptor, thereby creating a firmer hold on the joining bar. The special extension bar is quickly readied to cut circles up to 60 in. in diameter, which, plus the 8 in. length of the torch radius bar equals 30 in. possible radius with the use of one extension bar. Larger circles (to any diameter) can be accurately cut with multiple extension bars joined together. Scientific Research Co.

SELF ADJUSTING WRENCH

94 A new automatic self-adjusting and self-locking wrench with a ratchet action is available in two sizes, 6 and 8 in. The 8 in. size will take nuts from $\frac{7}{16}$ to $\frac{1}{18}$ in., thus covering practically the entire range of five open end wrenches. The jaws are made from chrome vanadium drop forged steel. The handle is made from alloy steel, both properly heat-treated for durability. Finish is black dulite. E-Zee Tool Mfg. Co.

LUBRICATOR FILTER

95 A new Lubri-Filter, combining a lubricator and filter, designed for compressed air lines, has been announced. The unit protects air-driven equipment against dry-running breakdowns and impurities in the air supply. Air is cleaned automatically by a permanent type, cleanable filter element which is said to require no replacement. Atomized oil is automatically injected into the air line in proper amounts. Oil level can be seen from any angle. Model 605 Lubri-Filter is precision-built of aluminum and brass, and provides an unrestricted air flow of $\frac{1}{4}$ in. I.P.T. Price $5.75. Jarrett Compressor & Equipment, Inc.

THREADER POWER DRIVE

96 The development of a new power drive for operating hand pipe cutters, threaders and reamers is announced. The new unit, named the Porta-Power Drive, weighs only 100 lb. Cleanly housed in a modern style case, it has a 3-jaw lathe-type scroll chuck in front and a self-centering workholder in rear which turns with the pipe. Additional features include a special chuck wrench ejector that safely removes a wrench the operator forgets, a bump-proof start and stop switch, and permanent sealed-in lubrication. The Porta-Power Drive plugs into any 110 a c light socket; motor is reversible. The unit is 19¼ by 18 in. at the base and 12 in. high. It can be mounted on standard pipe legs to form a stand or bolted to a bench. The unit's capacity is from $\frac{1}{8}$ to 2 in. pipe and up to 8 in. pipe when used with the universal drive shaft. Ridge Tool Co.

GERMICIDAL STERILAMP

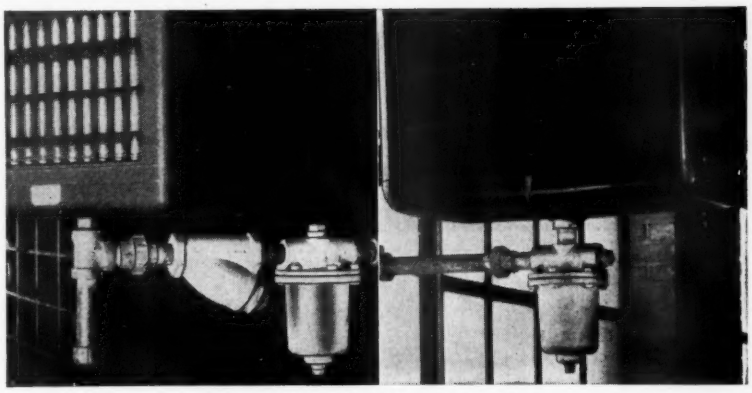
97 A 25-watt Slimline Germicidal Sterilamp has been developed. The lamp is 36 in. long. It is designed for starterless operation with standard 64T6 Slimline Fluorescent lamp auxiliaries, will operate in any position satisfactorily down to freezing temperatures, although optimum operation is at room temperature. Characteristics of the lamp are: Designation, G36T6; rated watts, 26; overall length plus lampholder, 36 in.; bulb nominal, T-6; lamp current, 100, 200 or 300 milliamperes depending on rating of ballast; minimum open circuit voltage, 600; rated average life; 6000 hours (12 hours per start); maximum intensity (2537A) microwatts per square centimeter at one meter at 200 ma, 95; ultaviolet output at 2537A, 8.5 watts; ozone, negligible; base, FA-16 single pin; auxiliaries, same as for 64T6 Slimline fluorescent lamp. List price, $10.00. Lamp Division, Westinghouse Electric Corp.

New Products and Methods

GAS FIRED AIR HEATER

98 Designed to end the cold floor problem in non-basement factories and offices, a new gas-fired forced air heater, with floor-level warm air discharge, is introduced. Named Panelair, the new unit provides the essentials of forced air heating. In a compact casing, the vented heater measures 20⅜

THIS Steam Trap
saves fittings either way



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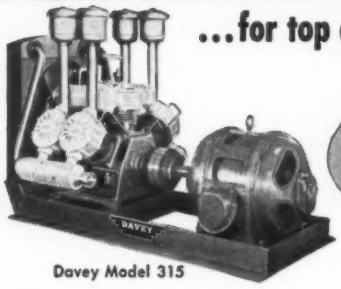

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- Lower air losses
- Maximum air operating efficiency
- Make plant expansions easy and economical
- Eliminate shutdowns due to compressor failures
- Air cooling eliminates water bills
- Ease of installation
- Reduced maintenance and replacement expense

IN LINE with today's trend toward employment of small departmental compressors instead of one large centralized machine, Davey offers a complete line of industrial units.

These are available in 60, 105, 160, 210 and 315 c.f.m. capacities. And every Davey has GUARANTEED LIFETIME VALVES.

DAVEY COMPRESSOR CO. • KENT, OHIO

Write for Bulletin E-219

DAVEY

P&P-102

DAVEY COMPRESSOR CO. *Dealers in Principal Cities*

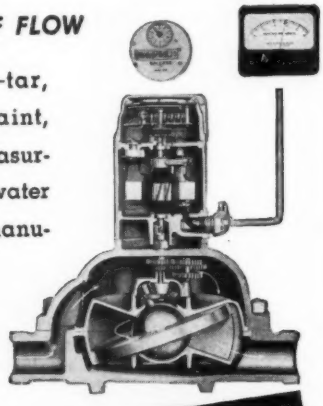
NEW

HAYS Veriflow TOTALIZING-INDICATING METER

Featuring

REMOTE INDICATION OF RATE OF FLOW

For practically all liquids—tar, molasses, crude oil, grease, paint, varnish, syrups, etc., etc.—for measuring, indicating, totalizing flow of water and chemicals in continuous manufacturing processes and numerous other uses. Its remote indicating feature is new—get the complete story.



SEND FOR BULLETIN. 46-766

The HAYS CORPORATION
Since '90 COMBUSTION & INDUSTRIAL INSTRUMENTS & CONTROL
MICHIGAN CITY, INDIANA, U.S.A.

New Products and Methods

in. across the front and 9⅜ in. from front to back. Warm air discharge is possible from all four sides to heat a large work area. Two fans draw return air from the ceiling and heated air is forced out near the bottom through grilles. These small grilles are the only portions of the heater to be exposed when it is recessed in a wall. Floor-level warm air discharge counteracts the tendency for warm air to collect around workers' heads and cold air to settle to the floor. The unit burns any type of gas fuel. Operation is fully automatic. Payne Furnace Co.

NEW V-BELT

99 A new Ray-Man V-Belt has been developed to meet the need for a belt possessing features particularly applicable to tough rugged drives. According to the manufacturer, the engineered strength members have been especially designed for this type of service, and added features of oil, heat and static resistance provide a belt with qualities for unusual service requirements. Raybestos-Manhattan, Inc.

CORE SOLDER

100 A new development in acid core solders is announced. Heretofore Tri-Core has been available only with the rosin-filled flux for radio and electrical work. A few of the many advantages of Tri-Core solder are: Its ability to solder stainless steel, monel, nickel and other metals hitherto not usually solderable with a core solder. Three cores instead of one. The synthetic acid used is considerably more active as a flux than the usual zinc chloride, yet only half as corrosive. Furthermore, it is readily soluble in water, and is easily washed off. A definite soldering sequence is automatically developed by three cores of flux.

Tests show that the only metals which this flux will not solder are aluminum and magnesium. When a core solder is used, it is absolutely necessary that the work be heated by the iron or flame. After this, the core solder is introduced to the heated metal, which has been brought up to the liquidus point of the solder, so that the flux can flow onto the job ahead of the molten solder. Alpha Metals, Inc.

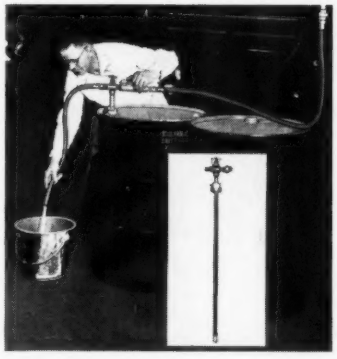
FELT for PACKING

101 Felt, in combination with Hycar American-rubber latex and Hycar sheet stock, is being used to produce mechanical sealing, packing and gasketing materials. Cut into strips and washers, these materials are available as Vistex and Oil Foil. Vistex is a Hycar latex impregnated and laminated felt base packing and sealing material. By controlling the ratio of felt fibre to the amount of Hycar impregnant used as a saturant, the self-lubricating property of Vistex was attained. In proper balance, the felt fibres retained sufficient capillarity or wetting property to make a well-lubricated packing, and the Hycar latex saturation was so complete that positive sealing against dirt and moisture, dimensional stability, and excellent resistance to oils and fluids was maintained. The Oil Foil seals combine in a single laminated bearing seal washer the conventional felt seal and one or more impervious septums of $\frac{1}{64}$ or $\frac{1}{32}$ in. Hycar sheet. Many types of Oil Foil washers can retain oil to the extent of more than 400 per cent of their own weight. A Hycar septum on the outside surface of such a washer will prevent loss of lubricant to the outside and inside sealing against dirt and moisture. B. F. Goodrich Chemical Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

SOLUBLE OIL MIXER

102 A new soluble oil mixer for use in industrial plants has been announced. This mixer performs three operations simultaneously. It proportions water and soluble oil, mixes them into a uniform emulsion, and transfers the soluble oil from the original drum into another container ready to pour into the machine sump or circulating system. The mixing unit is inserted in the bunghole of a drum of soluble oil, connected by hose to a water outlet, and adjusted. Water pressure, 24 - 30 psi, is the only power required. Unit weighs 5½ lbs. Model 6780 is supplied with a two-in. pipe thread sliding bung adapter for various heights of drums. It has a ⅜ in. female pipe-thread union inlet for water hose and a ½ in. male pipe-thread connection for outlet hose. Height is 40⅜ in. Alemite Div., Stewart-Warner Corp.

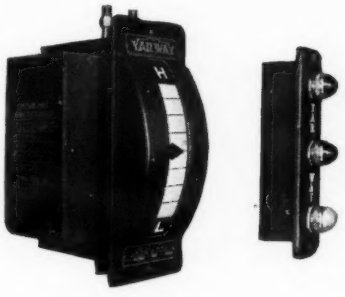


BELT FASTENERS

103 Announced is a new line of fasteners and repair plates for heavy duty conveyor belts. So designed that they can be applied anywhere, these Plategrip belt fasteners pull belt ends together into a smooth, flexible tight joint. Made of heavy gauge steel and so designed that they will withstand any load the belt can safely carry. Individually spaced, they permit troughing. They make a smooth flush joint that easily passes under strippers. A 2 sided joint that permits use of both sides of a belt. Fasteners are provided for belts from ¼ to 1½ in. thickness and packaged in sets of 10 of a size to a box. Companion repair plates are also available for repairing tears and cuts or for inserting patches in worn spots. Armstrong-Bray and Co.

HIGH-LOW WATERS SIGNALS

104 To extend the use of its remote liquid level indicator this company has developed a new attachment for operation of one or more distantly located electric type visible or audible high-low alarm signals and/or controllers for pump motors or other devices in steam power stations and industrial plants. The new control unit is attached directly to the indicator and registers all variations of the level in boilers, feed water heaters and other storage vessels. The control unit consists of simple two-pole curved-bar permanent magnets fixed to shaft of indicator pointer and actuating one or the other of two sealed-in glass mercury switches which in turn operate the high-low alarm signals installed at remote locations where additional check on the liquid level may be required. Yarnall-Waring Co.



SMALL MEGOHMER

105 The Minor insulation tester is a small size instrument with a range of 0 to 50 Megohms, with 500 v dc variable pressure wheel generator. The scale, 2½ in. long is clear and legible. Case is moulded bakelite, fitted with carry handle. Magnet of the unit is cobalt steel. The guard circuit prevents errors due to leakage current. It is claimed to be a true ohmmeter of the cross coil type. The height has been arranged to give ample clearance for swinging the generator handle. Herman H. Sticht Co., Inc.

TYPE B
KECKLEY

INVERTED BUCKET STEAM TRAP

This Keckley Trap is made with stainless steel working parts and embodies advanced improvements in design, construction, operation, materials, installations, and maintenance features.

The cover plate, mounted at a most convenient angle with the body, carries the entire working mechanism of the Trap. It can easily and quickly be removed from the Trap body without breaking any pipe connections.

From the cover is suspended the bucket and lever with valve through a fulcrum plate which serves also as the valve seat retainer. An outstanding feature of this Keckley Type B Trap is the positive alignment of the valve with respect to the valve seat, so important in the continued performance of any Trap. This is accomplished through the dual purpose "fulcrum and valve retaining plate," eliminating any possibility of misalignment such as occurs when the fulcrum point is dependent upon lugs in the cover or similar arrangement, where a slight inaccuracy in machining can cause considerable variation in relation of valve and seat. Tight seating in such cases is difficult whereas in the Keckley Type B Trap it is positively assured at all times.

Write for Bulletin No. 52 showing the outstanding advantages for dependable service and economy.

Steam Traps—Temperature Regulators—Pump Regulators Water Gauges—Gauge Cocks—Strainers

O. C. KECKLEY COMPANY
400 W. MADISON STREET
CHICAGO 6, ILLINOIS

*REG. U. S. PAT. OFF.

Rugged, accurate and direct-reading, the "Ducter" Low Resistance Ohmmeter provides an easy and practical way to test air and oil circuit breaker connections and contacts; cable joints; bus bar and line connections; armatures and series fields of generators, and motors; and low resistance transformer windings. It is also a valuable tool in quality control and for indicating relative strength and conductivity of welded joints.

One man can quickly make resistance measurements down to a millionth of an ohm—in the field! There are no calibrations or adjustments—not even for the voltage of the battery that supplies the necessary test current—and there are no calculations or charts. The resistance measurement is read directly from the position of the pointer on a scale.

The "Ducter" operates from an external battery or plug-in power supply. On every range it is compensated for outside temperature changes. Various ranges from as low as .0001 ohm up to 5 ohms full scale.

A complete description, together with circuit diagrams, applications, and specifications are contained in Bulletin 24-25—F. Write for your copy TODAY and learn all about this truly remarkable instrument.

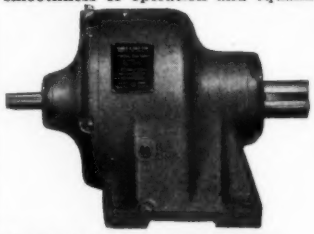
JAMES G. BIDDLE CO.

Electrical & Scientific Instruments

1316 ARCH STREET, PHILADELPHIA 7, PA.

SPEED REDUCER

106 The Patented Helical Gear Differential Speed Reducer is available. The new model retains all the advantages of previous models. Unlike ordinary planetary gear systems, the gears of the Winsmith Differential Helical Gear Reducer are made integral and combined in a planetary frame to form a complete unified planetary element. Constantly maintained smoothness of operation and equalized load distribution through all three sets of planetary gears are the results. Ratios from 5 to 1 to as much as 50,000 to 1 can be provided with no increase in number of parts. Horse power ranges from .62 to 81.5. Six sizes are available for every phase of industrial service, all with a streamlined compactness that saves valuable space. They are made in horizontal, vertical and flange-mounted styles. Winfield H. Smith Corp.

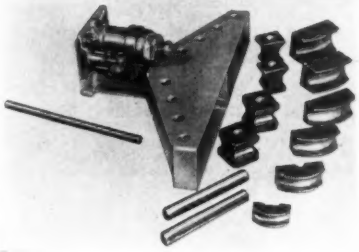


METAL ADHESIVE

107 An unsupported film of pure adhesive that provides a metal-to-metal bond resistant to shear tests up to 3,500 psi is announced. Called Scotch-Weld Bonding Film, it is transparent, roughly resembles cellophane in appearance, is provided in rolls like tape and is not tacky to the touch. The film is placed between units to be bonded and is cured by simultaneous application of heat and pressure—a heat of 300 to 500 F for 5 to 60 minutes, and a pressure of 25 to 100 psi, both varying with the type of bond desired. Manufacturer's tests reveal shear strengths to 3,500 psi in bonding 0.064 in. aluminum Alclad to itself. In bonding the same metal to fibre, wood and plastic surfaces, the nonmetallic materials delaminated at 880, 1,770 and 2,800 pounds per square inch respectively. Minnesota Mining and Mfg. Co.

PIPE BENDER

108 This new lightweight, portable tool forms smooth, uniform pipe bending operations right on the job. Weight has been kept down to a minimum without loss of strength. The combined weight of the jack and frame is only 83 lb. Removable hydraulic jack simplifies the service problem and can be used for other purposes. Of open jaw construction. The 30 in. steel frame is electrically welded and heavily reinforced. Comes complete with ¾, 1, 1¼, 2 and 2½ in. dies. Price, $125. Electric Cord Co.



Bulletins . . . . Catalogs

ELECTRICAL

200 **Handbook on Electrical Conduit** — Bulletin 351, 64 pages, is filled with engineering data of value to users of electrical conduit. Electrical data, definitions of terms, symbols, instructions and information of aid in computing conductor sizes, handy reference material and tables make up the engineering portion of this useful book. Other pertinent information is supplied. Spang-Chalfant Div., National Supply Co.

201 **Small Switches** — Data Sheet No. 46, describes the two low torque switches. Characteristics and dimensions are given as well as prices. Also gives instructions on assembling and adjusting torque. Soldering cautions are presented. Micro Switch.

202 **A C Solenoid Contactors** — Bulletin 4452 and 4453, 4 pp., describes features, application, construction, accessibility, main contacts, coils, auxiliary contacts, push button stations, and optional features. Dimensional drawings are given for each of these two contactors. Ward Leonard Electric Co.

203 **Selenium Battery Charger** — A four page bulletin describing the Edison-nickel-iron-alkaline automatic battery charger, selenium, full wave, 80 per cent efficiency. General specifications are given for 7 models. Richardson-Allen Corp.

204 **Industrial Electric Motors** — Bulletin MB-1 6 pp., contains cutaway and phantom views which depict the construction and special features of these motors for industrial applications. Also shown and described

is the motor driven multispeed gearshift. Lima Electric Motor Co.

04 **Ball Bearing Electric Motor** — Form No. 1904, 6 pp., describes and illustrates the ball bearing electric motors of four different windings made by this firm. Robbins & Myers, Inc.

205 **Large Induction Motors** — Bulletin 05B-6132A, Charts electrical characteristics, power factors, and range of starting torques of motors larger than 200 hp. A motor selection chart show ranges. Allis-Chalmers Mfg. Co.

206 **Fabricated Steel Synchronous Generator**—Bulletin PB 2000, 4 pages, contains 15 detailed views which explain construction features. Mechanical modifications are also included. Elliott Co.

PROPERTY MAINTENANCE

207 **Monel Tie Wire** — Bulletin 9-M, 8 pp., presents the why of tie wire, the uses it covers, and how to install it. Installation and places it should be used are shown. Characteristics are given. International Nickel Co., Inc.

208 **Floor Repairs** — Bulletin 1-2-3, 6 page folder, describes the steps necessary for repairing rutted and cracked floors with this material. Firm claims that any one can do the job. Stonhard Company.

209 **Nailable Steel Framing**—This 20 pp. bulletin describes the steel framing to which any material can be nailed. Erection methods are shown in step-by-step sequence. Numerous photos show examples of how it can be used. Engineering data and safe loading tables with formula used are given. Accessories are illustrated. Stran-Steel Div., Great Lakes Steel Corp.

210 **Sound - Deadening** — Bulletin AC-34A-7-48, 8 pages, describes and explains the effect installation of this material has. Photos and sketches show application methods. Table of sound absorption coefficients is provided. Johns-Manville.

211 **Flooring Material** — Bulletin K-801, 4 pp., is a case history study of 8 different installations in well known plants of this firm's flooring made from natural mined emery. Walter Maguire Co., Inc.

212 **Dispersed Black for Darkening Concrete**—This four page bulletin shows typical installations which were made using this concrete darkening agent. A. C. Horn Co., Inc.

213 **Stopping Corrosion** — A four page bulletin illustrating with photos and sketches how the coating made by this firm protects surfaces from corrosion. A list is given of the solutions which coating resist. Prufcoat Laboratories, Inc.

214 **Glass Building Block** —Bulletin 1B69-R3, 6 pp., describes and illustrates with photos the different designs and sizes of glass block for building purposes. Table of dimensions is given. American Structural Products Co.

215 **Mastic Asphalt Insulation** — Bulletin 1-648, 2 pp., describes the product of asbestos fibrated, emulsified asphalt in mastic form for protecting insulations from water, acid, spray and other corrosive liquids. Bitucote Products, Division of Bridges Paving Co.

216 **Oil and Grease Absorbent**—Bulletin FB-14, 8 pages, explains the product of this firm that is spread on oil or grease soaked floors and which it is claimed will absorb the oil or grease which makes the floors dangerous for walking. Safety and Maintenance Co., Inc.

217 **Paint Color Information** — Refinisher No. 72, 42 pages, is the listing of paint colors and finishes. There is a list of 704 colors, of one type and 261 of another type. A list is given of 712 color names. Finishes Div., E. I. du Pont de Nemours & Co., Inc.

218 **Concrete Floors**—This 12 pp., bulletin tells the mixes of cement, stone, sand, and water to be used for both new floors and repairs to old ones. The correct preparation and application is shown in step-by-step photos with explanatory text. Lone Star Cement Corp.

219 **Floor Machine** — Bulletin AC 2-8, is a 4 pp., folder describing briefly the low height floor machine made by this firm for industrial and office use. This is primarily a price list of the machine and its attachments. General Floorcraft, Inc.

MECHANICAL POWER TRANSMISSION

220 **Differential Speed Reducer** — This four page bulletin describes a speed reducer with helical gears. Six sizes are shown with specifications. Photos and exploded views illustrate the features and construction and assembly. Winfield H. Smith Corp.

221 **Drive Chains** — Catalog 808, 60 pp., describes and illustrates with numerous photos of applications the use of these drive chains in industry. Detailed explanation is given of construction. A drive chain index is provided, as are hp ratings, and handy engineering data for applying drive chains. Each type of chain and sprocket wheels are described completely. Jeffrey Mfg. Co.

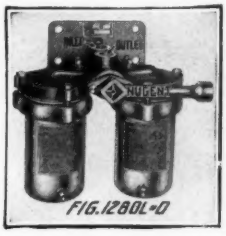
222 **Variable Speed Motor Drive**—Form 1515, 16 pp., uses color to depict the construction and application of these variable speed motor drives. Drives use V-belts. Also depicted are the remote controls available, as is the wide choice of types. U. S. Electrical Motors, Inc.

223 **Variable Speed Transmissions** — Bulletin 67110, 8 pp., describes and illustrates with photos, dimensional drawings and tables, the various models of these small variable speed transmissions. Oilgear Co.

224 **Cast Iron Pulleys** — Catalog No. 60, 10 pages, contains new list prices and a description of the various types of pulleys which can be produced. All selection and ordering information of these pulleys is given. Pyott Foundry & Machine Co.

225 **Waterproof Pulley Lagging** — This 6 pp. folder illustrates the steps necessary for application of the product. Directions are

MORE filtering area *means* MORE protection!

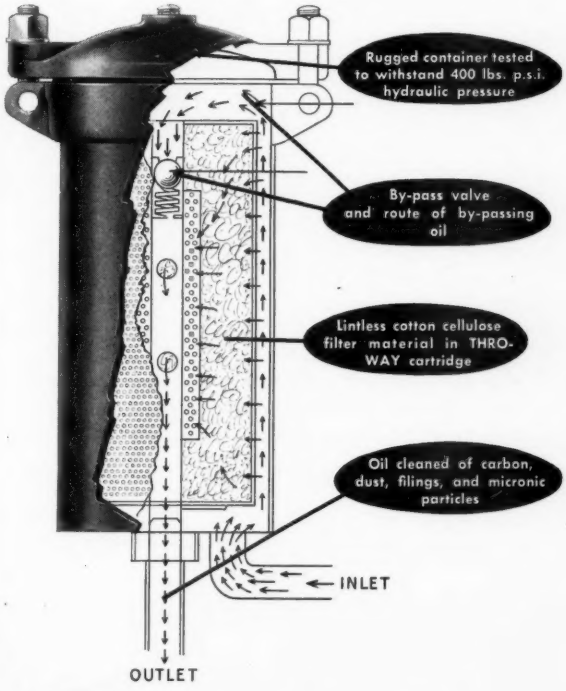


• Nugent Lube Oil and Fuel Oil Filters have approximately twenty times more filtering area than other filters of comparable size . . . they operate twenty times as long without cleaning. Nugent Filter elements are made as the inexpensive replaceable "THROWAY" cartridge, or in repackable bag form. Single filter containers are made to accommodate from one to twelve filter elements, and have capacities up to 182½ GPM of lube oil, or 1096 GPM of fuel oil.

Some of the many types of installations which benefit from the use of Nugent Filters include diesel locomotives, commercial and naval vessels, stationary power plants, and pipe line pumping stations. Ask to have a Nugent engineer recommend the correct filters to meet your specific requirements.

Above view: A Nugent Duplex Pressure Oil Filter.

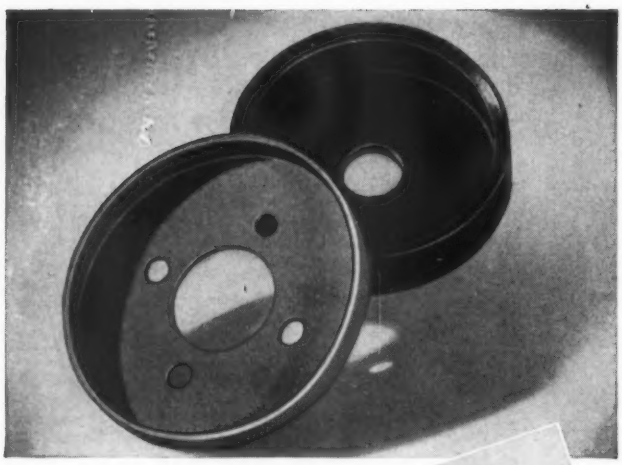
Below: Cutaway view of a Nugent Depth-Type Pressure Oil Filter.


Rugged container tested to withstand 400 lbs. p.s.i. hydraulic pressure
By-pass valve and route of by-passing oil
Lintless cotton cellulose filter material in THROWAY cartridge
Oil cleaned of carbon, dust, filings, and micronic particles
INLET
OUTLET

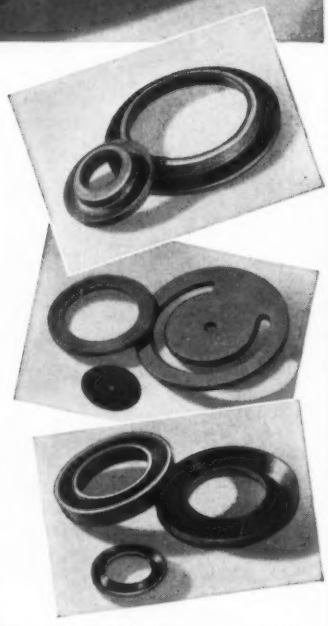
NUGENT TRADE MARK Est. 1897

Wm. W. Nugent & Co., Inc.
423 N. Hermitage Ave. CHICAGO 22, ILLINOIS

Oil Filters, Oiling and Filtering Systems, Telescopic Oilers, Oiling Devices, Sight Feed Valves, Flow Indicators . . . *Representatives in Principal Cities*



For Severe Leather Packing Service



Garlock BITAN* Leather Packings are tanned and treated by an exclusive Garlock process for the most severe leather packing applications. They operate satisfactorily at higher temperatures and higher pressures than leathers of standard tannage and treatment.

In filling each order, the leather is properly tanned and treated for the particular service for which the finished product is to be used. All types or forms including: Molded Cups, "U" and "V" Packings, Flange or Hat Packings, Gaskets, Washers, and Discs. All sizes. Write for descriptive folder.

THE GARLOCK PACKING COMPANY
PALMYRA, N. Y.
In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

*Reg. U. S. Pat. Off.

GARLOCK *Bitan** LEATHER PACKINGS

also included. Condersite Engineering Corp.

226 **Manganese Bronze Chains** — Bulletin No. 204, 4 pages, presents the detachable type chain and the pintle type chain with tables of engineering specifications and list price per foot. Chains are intended for general conveying use and power transmission applications. Valley Foundry & Machine Works, Inc.

PUMPS AND COMPRESSERS

227 **Portable Air Compressor** — Form 145, 8 pp., describes and illustrates with phantom and cutaway views and many application photos the small portable compressor mounted on a 2-wheeled trailer for towing behind a car. Also shown are air tools. Ingersoll-Rand.

228 **Centrifugal Turret Pumps**—Bulletin 1202, 4 pp., explains the construction features of these pumps and gives advice about the applications they are suitable for. Dimensional drawing and table and a head capacity table are provided. Yeomans Brothers Co.

229 **Rubber Impeller Pumps**—This 50 pp., catalog describes all the different models of rubber impeller pumps. Each pump is described separately. List prices are given. Head capacity tables are given. Drives which may be adapted are explained. Jabsco Pump Co.

230 **Small Air Compressors**—Form 714R, 20 pp., illustrates the several sizes of automotive type air compressors. Complete specifications given. Advantages of construction explained. Wayne Pump Co.

231 **Heavy Engine Compressor and Pump Products**—This 8 pp., bulletin describes briefly but comprehensively the complete line of products made by this firm. Types, sizes, drives, fuels, speeds, design and construction information is given. The Cooper-Bessemer Corp.

TREATMENTS

232 **Boiler Water Conditioner** — This 4 page bulletin explains the dangers of untreated boiler water and then explains how a formula prepared by this firm to suit a particular boiler and water will help to eliminate scale formation, establish corrosion control, inhibit pitting, and promote the production of clean steam, as claimed by this company. Alladdin Laboratories, Inc.

233 **Slime and Lime Scale Control**—Form 6261R, 4 pages, describes the action the chemical solution made by this firm has on slime and lime scale in evaporative condensers and coolers. The steps to be followed when preparing to use and when using the solution are outlined. Oakite Products, Inc.

234 **Fuel Oil Conditioner** —This 4 page bulletin explains the product of this firm which is made for fuel oil conditioning. The principle on which it operates and the actual application of it are described. Garratt-Callahan Co.

235 **Boiler Preservative** — This 6 page folder describes the boiler water treatment compounds created by this firm to suit a particular boiler and water. The product, the service, and the research offered are discussed and explained. Garratt-Callahan Co.

DUST CONTROL, HEATING, VENTILATING

236 **Air Venting Steam Equipment**—Bulletin No. 275, 4 pp., contains application descriptions of these air vents as applied to various industrial equipment. Dimensional drawings and tables with list prices are provided. Sarco Co., Inc.

237 **Cooling and Condensing Units** — Catalog No. 448, 8 pp., contains illustrations, diagrams and dimensions, and full descriptions of these units which are claimed to be immense. Outstanding features of construction are shown. Young Radiator Co.

238 **Dust Collecting and Air Handling Equipment**—A 4 page circular to serve as an introduction to the several types of equipment made. Shown are blowers, bag type dust arrester, cyclones, and hydraulic collectors. Northern Blower Co.

239 **Evaporative Coolers**—Bulletin C-1100-B27A, 8 pages, describes these coolers and presents specifications, capacities, and accessories needed for both single and multiple engine installation. Worthington Pump and Machinery Corp.

240 **Industrial Stokers**—This four page bulletin describes briefly the ram and worm feed type stokers made by this firm for industrial use. Photos, and coal and gas flow drawings in color, show construction features and operation. Ratings are listed. Canton Stoker Corp.

241 **All Welded Boilers**—Bulletin No. 120, 4 pp., describes ten sizes of 15 through 80 hp welded 150 wsp boilers. Dimensions and data are given for each in a table. Union Iron Works.

242 **Packaged Dust Collecting Unit**—Bulletin No. RB-748, a catalog sheet, provides the main engineering data on the four sizes of this dust collector available. Dimensions, weights, and hp required are given. Parsons Engineering Corp.

243 **Electrostatic Precipitators**—This 8 page bulletin describes the evolution of this particular precipitator and illustrates the rectangular horizontal, and concentric cylinder types. Provided are questionnaire sheets for describing your needs. Koppers-Elex Precipitator Dep't., Koppers Co.

244 **Gas Unit Heater** — This 4 page bulletin describes and illustrates with photos of complete unit and component parts and a phantom view this series C unit heater. Sizes and capacities are given in a table. Dimensional drawing and table provided. Automatic Gas Equipment Co.

245 **High Temperature Insulation**—This is a 24 page catalog of the complete group of insulations

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 18 and 19 and 50 and 51.

offered. Charts and illustrations on conductivity and installation of both plastic and block are given. Also included are data on blanket and pipe insulations. Forty-Eight Insulations, Inc.

246 **Heat Insulation Material**—Form No. 5329, 4 pp., explains with a conductivity chart comparing product with other types of insulation. Information as to sizes of sheet, pipe coverings, arc shaped for tanks, is given. Sketches show some typical applications. Philip Carey Mfg., Co.

247 **Steam Pressure Drop through Separators**—This is a large fold out sheet from which it is possible to figure the pressure drop and capacity of company's separator needed. Supplemental sheet explains how to use chart and gives sizes of separators available. Wright-Austin Co.

248 **Sectional Steel Boilers**—A four page bulletin describing the boilers made by this firm which may be installed without removing any part of building. These are small boilers for up to 100 psi and 289 hp. Central States Steel Boiler Co.

249 **Shell and Tube Heat Exchangers**—Bulletin No. 4300, 12 pp., illustrates the complete line of these heat exchangers and allied equipment. A brief description accompanies each photo. Ross Heater & Mfg. Co., Inc.

250 **Floating Boiler Walls**—Bulletin 748, 4 pages, describes with numerous sketches the construction and application of the air tight refractory enclosures for water walled boilers. Explanation is presented in question and answer form. Geo. P. Reintjes Co.

251 **Condensate Return System**—Bulletin No. 3250-1, 4 pp., contains a large dimensional drawing with a table for sizes and dimensions. Unit specifications are given as is a unit selection chart. Cochrane Corp.

252 **Boiler Feed Pump Fluid Drives**—This 4 page bulletin describes the use of fluid drives for controlling the speed of boiler feed pumps. Photos, a cross-section, and a pump performance chart are given. American Blower Corp.

253 **Water Tube Power Boilers**—This 8 page bulletin describes and illustrates the Type CR boilers. Numerous gas and water flow drawings and close-ups of construction details are given. International Boiler Works Co.

254 **Heat Exchangers**—Bulletin 12-H, 12 pp., presents with photos and sectional drawings comprehensive data on single and two pass exchangers, vapor condensers, U-tube and tank type exchangers, fin tube units, and vent condensers. Dimension drawings and tables give the over-all sizes. Schutte and Koerting Co.

255 **Scotch Boilers**—Series 4000, 4 pp., describes and illustrates with installation photos the scotch boilers offered. Dimensional drawing and table with data is provided. Construction details explained. Johnston Brothers, Inc.

256 **Air Intake Filters**—Bulletin SIF, 8 pages, describes and illustrates the air intake filters for internal combustion engines, compressors, blowers, motors and generators. The parts of the filters are depicted and explained separately. Selection tables and charts are provided. Capacities are noted. Dollinger Corp.

257 **Liquid Precipitation**—Bulletin 2204, 12 pages, describes and illustrates the precipitator made by this firm for the removal of impurities from a liquid by precipitation, absorption, settling and upward filtration. Cutaway photos and cross-sectional drawings show the principles of operation. The Permutit Co.

258 **Gas Adsorber**—Bulletin 113A, 2 pages, describes and explains the gas adsorber for compressed air lines made by this firm. Drawings, photos, capacity table, and pressure table are provided. W. B. Connor Engineering Corp.

259 **Electrode Steam Boilers**—Bulletin 32, 4 pages, describes and explains the small electrode steam boiler made to be set right at the source of need. Capacity is 84 lb per hr up to 500 psi. Livingstone Engineering Co.

TOOLS

260 **Metallizing**—Bulletin No. 4-3, 12 pp., describes and illustrates the Type L metallizing gun for all types of repair work. The gun and all accessories needed are shown. Application photos show the types of work it may be used on. Metallizing Engineering Co., Inc.

261 **Portable Power Tools**—Catalog No. 486, 22 pp., describes the many power hand tools for cutting, drilling, breaking, surfacing, and roughing, made by this firm. Also listed are the many accessories for use with the tools. Syntron Co.

262 **Controlled Lubrication**—Form 22-154, 12 pp., presents in color this firm's four basic systems of centralized lubrication. Each of these systems are for industrial use and so designed that one operation greases all spots on a machine needing lubrication. The equipment that makes up the systems and the accessories are also described with selection tables. Alemite Div., Stewart-Warner Corp.

263 **Explosive Cartridge Stud Fasteners**—Bulletins 22 and 38 describe and explain the tools and studs for each, for different applications. Studs are of: solid head drive pin, utility head drive pin, internal threaded stud, externally threaded stud. Powder loads available are also described. Tempo Products Co.

264 **Drafting Machines**—Bulletin No. 6-48, 6 pp., describes the drafting machines made by this firm. Close-ups show special features of the machines. Emmert Mfg. Co.

265 **Pneumatic Tools**—Catalog No. 14, 60 pp., describes and explains these tools: drills, nutsetters, screw drivers, grinders,

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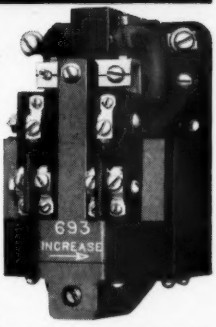

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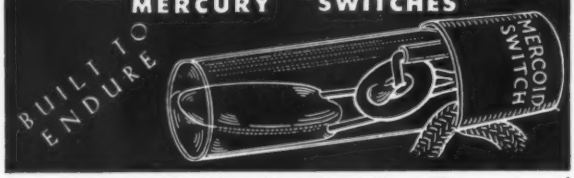

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chipping hammers, riveting hammers, compression riveters, air hoists, air motors, and accessories. Specifications are given for each. Keller Tool Co.

266 **Sand Rammers**—Bulletin No. 32, 4 pp., describes and depicts the various sizes and types of sand rammers offered by this firm. A specification table is provided. Rotor Tool Co.

267 **Cleaners for Small Tubes** — Bulletin J-410, 4 pp., describes and illustrates the entire Junior line of cleaners for small tubes. It also shows various types of cutter heads, brushes, lubricators, operating hose, and accessories. Roto Division, Elliott Co.

268 **Tube Expanders**—Bulletin No. 43, 4 pp., describes and illustrates the tube expanders for use on boiler and heat exchanger tubes. Each type is shown with accompanying data. Tools, extensions, ratchets, for use with expanders are also described. Airetool Mfg. Co.

269 **High Speed Shear** — This two page catalog sheet describes the small power sheer for cutting up to 14 ga. Features of the shear are illustrated and specifications given. Federal Machinery Co.

INSTRUMENTS AND CONTROLS

270 **Dial Scales**—This 74 pp. bulletin, No. P-714, is a collection of smaller bulletins depicting the entire line of dial scales made by this firm. All types of illustrations, tables and charts, are used to explain the mechanism, mounting, and capacities. Philadelphia Div., Yale & Towne Mfg. Co.

271 **Capacity Data for Orifice-type Meters**—Bulletin T-100-M, 12 pp., explains this firm's method of reaching, within certain limits, the determination of given line size, meter differential, and fluid quantity by the use of a simple basic formula and reference to a simple graph. Book is all engineering data. Hagan Corp.

272 **Liquid Level Recorder** —Bulletin WG-1830, 8 pp., describes and illustrates the improvements that have been made in these recorders. Mounting dimension drawings, phantom views, hook-up diagrams, and installation photos are used to further show improvements. Yarnall-Waring Co.

273 **Megohmer Insulation Tester** — Bulletin No. 450, 4 pages, illustrates the use, gives scale facsimile, and shows small size. Features of the instrument are described. Herman H. Sticht Co., Inc.

274 **Carbon Monoxide Tester**—Bulletin No. BY-1, 2 pp., describes and tells how to operate this

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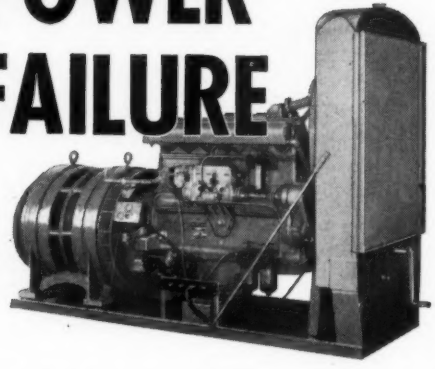

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colorimetric CO tester. A table is given to show the effects of CO for a given time on human beings. Mine Safety Appliances Co.

275 **Insulation Testers** — Bulletin 4-3, describes the insulation tester for testing insulation and resistance. Applications for which the instrument is suitable are given. James. G. Biddle Co.

276 **Electric Hand Tachometers**—Bulletin No. 103, 4 pages, describes and explains the electric hand tachometers and accessories for speed measurements. Ranges, prices, and typical applications are shown. Metron Instrument Co

277 **Chemical Feeders** — Bulletin INS 2B, 16 pp., is a technical bulletin on the installation, operation and maintenance of this firm's automatic and proportional chemical feeder. It contains detailed instructions on each phase of use. Proportioners, Inc.

278 **Pyrometer Controller** —Bulletin' No. PB-1237, 6 pp., describes the application of the new instrument in proportioning the current input to electrically heated devices. Connection drawings and typical charts are given. Bristol Co.

279 **Flow Rate Kit**—Bulletin No. 5, catalog sheet, gives a capacity chart, dimensions, and general illustrations of this flow rate kit for laboratory and pilot plant. Brooks Rotameter Co.

280 **Remote Hydraulic Controls** — Bulletin 2001, 8 pp., illustrates and explains the many applications which these controls find in industry. Sectional drawings show construction. Sperry Products, Inc.

281 **Leak Detector**—This bulletin sheet describes and explains the applications to which this electronic leak detector is suitable. General specifications are given. Consolidated Engineering Corp.

282 **Gear Tester** — A ten page folder describing the models of the gear tester. Features and application data are given with specifications. Each of the several models are illustrated with photos. George Scherr Co., Inc.

283 **Instrument Panels and Cubicles**—Bulletin 125, 12 pp., contains technical data on designing cubicles and panels for instruments and controls. Numerous drawings, photos, and sketches with dimensions illustrate the applications which these enclosures find in industry. Falstrom Co.

284 **Graphic Meters**—Bulletin No. 35, 16 pages, pocket size, presents the instruments made by this firm for keeping a check on equipment so that breakdowns can be avoided. Esterline-Angus Co., Inc.

MATERIALS HANDLINGS

285 **Power Belt Loading Conveyor** — Bulletin SJA-N48, 2 pages, illustrates the applications of this portable loading conveyor. Unit is described in detail and specifications of all models are listed. Rapids - Standard Co., Inc.

286 **Industrial Tractor Cranes** — Bulletin 80, 6 pp., contains photos and specification tables for the several different models of cranes offered. A capacity chart is included. Various types of booms available are shown. Mercer Engineering Works, Inc.

287 **Electric Hoists**—Bulletin H-100 A, 8 pp., explains why you can't afford to lift by hand. Numerous application photos show the versatility of these electric hoists. Sketches explain outstanding features. Specifications and prices given. Whiting Corp.

288 **Industrial Truck Batteries** — Bulletin GB-753, 6 pp., describes and depicts the batteries with exploded views and photos. Engineering specifications are given in three tables. Gould Storage Battery Corp.

289 **Industrial Trucking Hints**—Bulletin 25E-7070, 20 pp., contains hints on safe intra-plant trucking procedure. Clearly presented are suggestions covering operation of hand, transporter, electric and gas lift trucks. Cartoons enliven text. Hints given on safe loading height, volume, piling and balance. Allis-Chalmers Mfg. Co.

290 **Multiple-Circuit Battery Chargers** — Bulletin 222, 4 pp., utilizes exploded views, line drawings, complete assembly photos, and detailed explanation of equipment to explain these chargers. Electric Products Co.

291 **Conveying Solutions** —Form No. 144, 24 pp., describes and illustrates numerous case histories to show how different firms solved their conveying problems. Photos of the actual installation and line drawings showing before and after arrangements. Lamson Corp.

292 **Industrial Switching Locomotives** — Bulletin GEA - 3666B, 16 pages, describes and illustrates this 45 ton diesel-electric locomotive. Numerous tables, charts, help to explain the adaptability and photos show accessibility. Apparatus Dep't., General Electric Co.

293 **Permanent Magnetic Separators** — Catalog No. 12, 8 pp., describes the complete line of permanent non-electric magnetic separators. Complete specifications on weights, sizes and strength comparisons for various types are given with table of operating capacities. Eriez Mfg. Co.

294 **Dump Truck Bodies** —Bulletin No. L-102, 4 pp., illustrates with many action photos the construction and application of this dump body that is intended for hauling concrete but can be used for other materials. Dumpcrete Div., Maxon Construction Co., Inc.

VALVES AND PIPING

295 **Stainless Flanged Piping Systems**—Bulletin 483, 4 pages, includes drawings, dimensions, and prices of new type fittings and flanges available in stainless 304, 347, 316, and other materials. Taylor Forge & Pipe Works.

296 **Blow - Off Valves** — Bulletin E-120, 4 pp., presents in tabular form the many different types of blow-off valves offered. These include quick-opening straight lever, and rack and lever valves, slow opening rack and screw valves, angle, and five different

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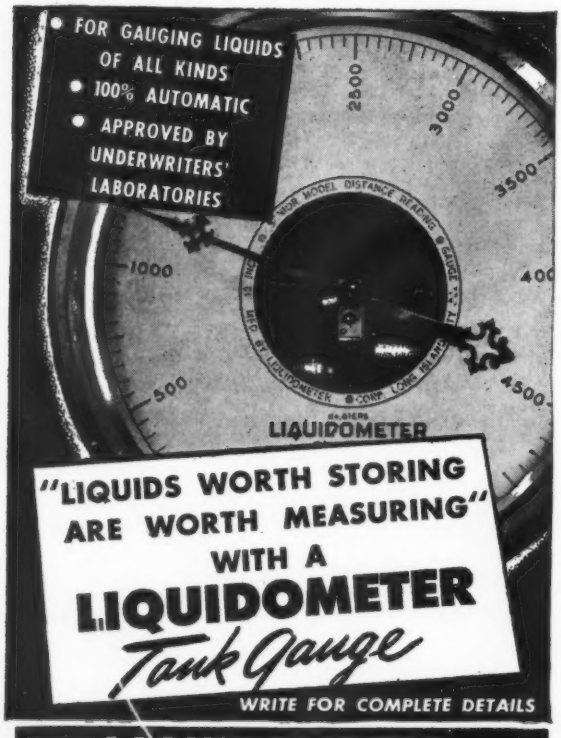
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297 **Thread Sealing and Valve Lubricant**—Catalog No. 909, 4 pages, presents each of the compounds made for thread and gasket sealing and valve lubricating. The sizes of containers in which compounds are available is given. Parker Appliance Co.

298 **Compressor Air Check Valves** — Bulletin 509 describes the check valves for use on compressor outlets. Photos of the parts of valve and a sectional drawing show construction. Pennsylvania Pump & Compressor Co.

299 **Stainless Steel Safety and Relief Valves** — This 4 page bulletin describes the several safety and relief valves made of stainless steel for different services. Sizes, and series are listed in table with list prices. Associated Valve & Engineering Co.

300 **Feeders and Rotary Valves**—Bulletin F-3, 8 pp., describes and illustrates with photos and dimensional drawings and tables these feeders and rotary valves. These are intended for use with granular materials. Fuller Company.

301 **Plug Valve**—Bulletin 91, 4 pp., presents the bronze plug valve and describes 14 design features and the sizes in which it is made. Engineering data is presented. Ampco Metal, Inc.

302 **Armored Porcelain Valves**—Bulletin 271, 2 pp., describes and illustrates these valves. Construction details are given. Dimensional drawings and tables with sizes provided. Lapp Insulator Co., Inc.

303 **Air Line Check Valves** —Bulletin 509, a catalog sheet, describes the check valve for air lines made by this firm. The principle parts are pictured separately and assembled. Pennsylvania Pump & Compressor Co.

304 **Bronze Gate Valves**—Circular No. 534, 12 pages, presents the new line of bronze gate valves for 200 lb service made by this firm. Illustrated with cutaway and exploded drawings to show construction and operation. Dimensions are given. Lunkenheimer Co.

MISCELLANEOUS

305 **Water Fountain Engineering Application Data**—Form TC-11, 6 pp., is solid engineering data to help the engineer figure the capacity of compressor, lines, fountains, for a given quantity of water to be consumed. Tal-Co Mfg. Co.

306 **Industrial Water Treatment**—A 20 pp., bulletin discussing the application of water treatment in industrial plants. Charts, photos, schemetic drawings, and sketches illustrate the subjects treated: Boiler water. Condensate return systems. Cooling systems. Air conditioning systems. The eight operations of this firm's water treatment system are described. Bird-Archer Co.

307 **Sanitation Clarifiers** —Bulletin No. 35-C, 12 pp., gives a complete description and specifications of the beam-type, circular clarifiers; center-column type circular clarifiers; and rectangular clarifiers for skimming and sludge collecting. Other sanitation plant equipment also described. Hardinge Co., Inc.

308 **Welding Courses** — Form ADG1084A, is a folder listing the books this firm has available for arc and oxyacetylene welding and cutting instruction. These books make up the necessary paper instruction of a course. Air Reduction.

309 **Arc Welding Electrodes** — Form No. ADWW 95, 42 pp., describes and illustrates the application of the various rods for welding made by this firm. Wilson Welder & Metals Co., Inc.

310 **Press Welders** — EnB Type Bulletin 3-123, 8 pages, describes in detail the motor driven press welders. Specifications and other engineering data are given. Taylor-Winfield Corp.

311 **Diesel Performance Aids**—Form 6422 R, 4 pp., explains the three aids to better diesel performance available from this firm. Two are for cleaning cooling systems and the third for exterior cleaning. Oakite Products, Inc.

312 **How a Diesel Engine Operates** — Bulletin A-209-LL, 12 pp., explains the technical details of a diesel engine including the accessories. There is practically no advertising as such. International Harvester Co.

313 **Dual Fuel Engines**—Bulletin 106-A, 8 pp., features a five color flow chart to show liquid flow of both fuels and governing oils. Also shown are several installation photos of the engines in operation. Nordberg Mfg. Co.

314 **Voice Recorders**—Bulletin P779, 8 pp., describes the applications which these belt voice recorders find in industry. Complete specifications are given and all equipment is pictured. Device uses a plastic belt for recording. Dictaphone Corp.

315 **Casting Process**—This 16 page bulletin describes the casting process of this firm. Listed are the claimed advantages. Shown are many of the types of products which can be made with the process. Microcast Div., Austenal Laboratories, Inc.

316 **Nickel and Brass Alloys** — A four page bulletin listing the properties and applications of nickel silver and nickel brass alloys. A page is devoted to explaining results of corrosion tests. Titan Metal Mfg. Co.

317 **Forgings**—This 12 pp., booklet explains the facilities for production of forgings. A check list enables comparisons of customers need and what firm has to offer. Champion Forge Co.

318 **Low Temperature Welding** — Bulletin EW-7, 8 pages, gives considerable information on the low heat alloys made by this firm for low temperature welding. Also described is a new cutting electrode for difficult to cut metals. Eutectic Welding Alloys Corp.

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319 **Arc Welding**—Bulletin V-3, 24 pages, pocket size, depicts with photos many uses that welding by arc can be used on. Also contains hints on maintenance of generator brushes, and other hints on the use of arc welders. Hobart Brothers Co.

320 **Resistance Welding Electrodes and Alloys**—Bulletin No. 68C, 24 pages, describes and illustrates the classifications, properties, and specifications of the electrodes made by this firm for resistance welding. Ampco Metal, Inc.

321 **Measurement of Color**—Bulletin No. 26, 8 pages, describes and explains the two systems of color measurement; the T.C.C.A. system and the Munsell System. Bakelite Corp.

322 **Industrial Diatomaceous Silica** — Form No. A236, 20 pages, is an explanation of the product of this firm that starts with the extraction of the product through the processing to the many and varied uses for it in industry. End uses of product include; high temperature insulation, filters, paper fillers, paint flatter, catalyst carrier, asphalt fillers, concrete admixture. Eagle-Picher Co.

323 **High Temperature Alloys**—Bulletin F-6612, 87 pages, contains available data on this firm's alloys. In addition to a general description of each alloy there are tables giving chemical composition and physical properties. Mechanical properties are presented in both tabular and graphic form. Short-time tensile properties and stress-rupture properties of all the alloys are also compared in graphs. Haynes Stellite Co.

324 **Engine Stop Systems**—Bulletin 8D, 4 pages, describes and illustrates technical data on emergency trip valves and auxiliary equipment designed to operate by either mechanical or electrical means. Dimensional drawings and tables are given for the various sizes of valves offered. Schutte and Koerting Co.

325 **Brass Rods**—This bulletin describes the location and stock that the warehouses of this firm has of brass rods in nearly any size that might be needed. Titan Metal Mfg. Co.

326 **Unfinished Business**—This is a title of a movie available to industry from this firm concerning the return of a war veteran and how he fitted into the expansion of the firm. United States Steel Corp.

327 **100 Years of Service**—This 32 page book is a beautiful job done for the purpose of explaining the growth of this firm through the years and to show all the various fields their products find a position in. Allis-Chalmers Mfg. Co.

328 **Foundry Shakeouts**—Bulletin No. 124-B, 16 pages, devotes the majority of its pages to description of the full floating shakeout. How complete mechanization of operations may be had by conveyorizing is told briefly. Robins Conveyors Div., Hewitt-Robbins, Inc.

329 **Abrasive Cutting Machine**—Bulletin DH 30, 4 pages, describes and explains the operation and construction of this machine which is designed to cut metals quickly. Andrew C. Campbell Div., American Chain & Cable Co., Inc.

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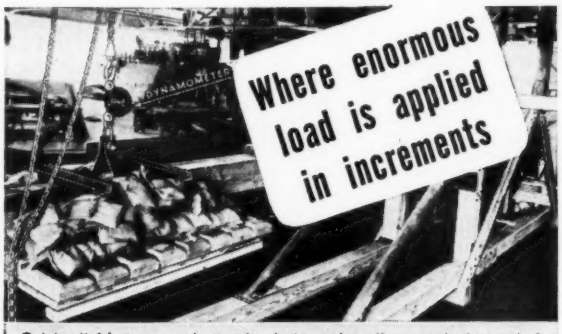

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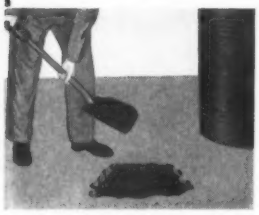

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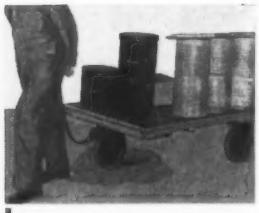

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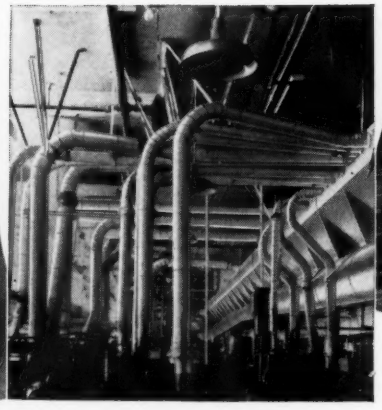

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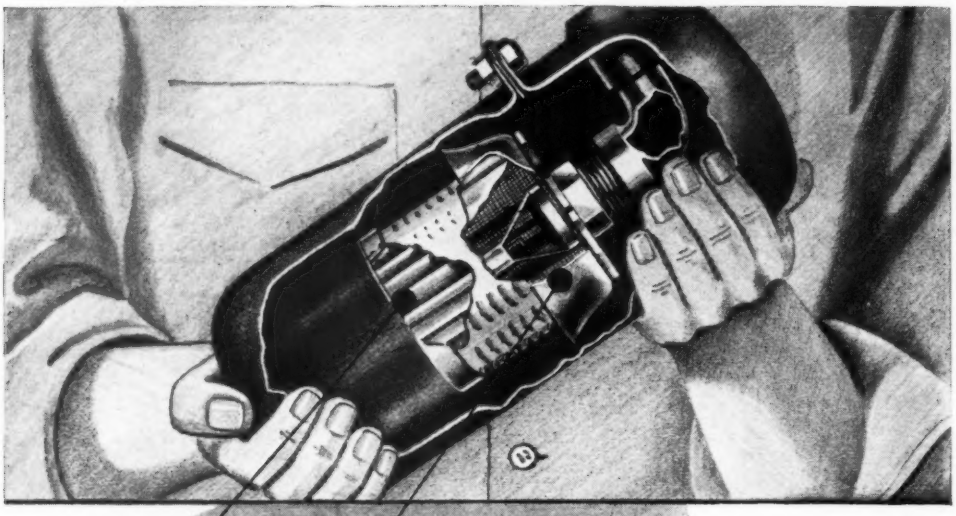

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